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# Edinburgh Medical Journal





# Edinburgh Medical Journal

With which is Incorporated the  
Scottish Medical and Surgical Journal

EDITED BY

ALEXANDER MILES AND J. S. FOWLER

*July to December 1920*

NEW SERIES—VOLUME XXV

Edinburgh

*Published for the Proprietors by*

Oliver and Boyd, Tweeddale Court

London: 33 Paternoster Row

1920







# Edinburgh Medical Journal

July 1920

## MODERN OUTLOOK ON THE TREATMENT OF TUBERCULOSIS.\*

By PROFESSOR SIR ROBERT PHILIP, M.D., LL.D.,  
University of Edinburgh.

### OLD-WORLD PESSIMISM.

IN the writings of Hippocrates "phthisis" heads the list of diseases which are "inevitably fatal." The syndrome of the classic portraiture is familiar to us all—the delicate pink and white colouring, quickly changing hectic flush, cough, hasty shallow respiration, rapid pulse, pyrexia, night sweats, worn frame, wasted muscles, and prostration. But that syndrome represents merely the *terminal effects* of infection by the tubercle bacillus. The earlier manifestations—the shading of health into disease, referable to the progress of infection—escaped recognition by the older school.

Some of us can painfully recall the pathetic picture of the consumptive in the old days, with phthisis written in every trait, waiting his turn at an out-patient department—the prolonged detention in a close waiting-room, hasty stethoscopic examination, the demonstration of physical signs to a group of students, the comfortless diagnosis, the shrug of the shoulder, followed by a return to the unhealthy environment, his sole consolation a prescription for some favoured cough-mixture or a bottle of cod-liver oil.

### PRESENT-DAY HOPEFULNESS.

The modern physician, in proportion to his experience of the disease, regards tuberculosis as most tractable if taken sufficiently

\* Being Address at a Meeting of the Medico-Chirurgical Society, 5th May 1920.

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early. The medical outlook on tuberculosis has undergone a radical change *within* a generation. The discovery of the essential cause has led to a recasting of our conception of the disease. This, in turn, has led to fresh lines of observation.

Evidence from many directions goes to show that Nature cures tuberculosis every day. The testimony of the post-mortem room is conclusive. The records of Nägeli (1900) established that definite indications of tuberculosis were found in 97 per cent. of bodies examined consecutively by him at Zürich, that is, of persons dying in a general hospital from all sorts of diseases and accidents. These careful observations, regarded by some critics as exaggerated, have been substantiated and reinforced by other workers.

Recently (October 1917) they were strikingly confirmed by Reinhart (Berne) who, in a long series of consecutive post-mortem examinations, found that 96 per cent. yielded evidence of tuberculosis. Reinhart went further and carefully analysed the 96 per cent., dividing them into cases which showed present activity of lesion and cases which showed more or less completely healed lesion. The remarkable fact emerged that of the 96 per cent. with evidence of tuberculosis, 32 per cent. presented evidence of progressive lesions. In other words, approximately one-third of all the patients who terminated their days from a variety of causes within a large general hospital were the subjects of advancing tuberculosis, while the remaining 64 per cent. presented evidence of healed tuberculosis.

This is an aspect of the subject which invites the careful attention of those in charge of large pathological departments. Teams of competent workers in representative centres in different countries might quickly table comparative results of first importance.

For our present purpose the significant fact is, that many persons make a good recovery from tuberculosis. More persons recover than ultimately die from the disease.

### TRADITIONAL BIAS.

Yet many a doctor still shakes his head regarding the curability of tuberculosis, or, alternatively, regarding the accuracy of the diagnosis if the condition is said to be curable or to have been cured. The man in the street is similarly at sea, unduly pessimistic if he accepts the doctor's diagnosis, or hopelessly negligent if he chooses to discount the diagnosis.

# Outlook on the Treatment of Tuberculosis

A large part of ordinary practice remains based on the old Hippocratic conception. Men are still apt to think of tuberculosis in terms of "phthisis." There seems a frequent failure to think out the various stages of tuberculous infection as they do in other infections, or to realise the *full significance of early diagnosis*, and the value of sufficient interposition at a stage when the foothold of the bacillus on the system is relatively slight and easily influenced.

There is often an unreadiness to admit the presence and potentiality of the invading organism, until the results of the invasion are too clamant to be overlooked. The striking portraiture of phthisis by Hippocrates and later masters in clinical medicine has so commanded attention as in some ways to *constitute a bar to the recognition of the subtler traits* of the disease which pathological observation and experiment have revealed. Thinking along the older lines, the practitioner finds it difficult to accept, as indications of tuberculosis, the earlier expressions of bacillary action.

Hence has developed the fallacious habit of labelling many of the finer features of early disease as "pre tuberculous" or "predisposing," if recognised at all. The diagnosis of tuberculosis is too frequently not accepted, until a point is reached when the diagnosis is of little therapeutic interest or value. Even then attention is apt to be restricted to evident phenomena in *one* organ rather than to the advance and distribution of an infection which is steadily poisoning the system. When therapeutic measures or Nature herself has stayed the process at one or other obvious point there is a tendency to drop interest and consider the matter closed.

## RECONSTRUCTION : FRESH OUTLOOK.

There is badly needed at the present time a general reconstruction of current views, or, at least, a change of standpoint whereby the outlook may become wider and juster. The faulty perspective needs correction.

Starting from certain demonstrable facts—best of all studied in the inoculated animal—we must endeavour to follow the natural history of tuberculosis in the widest sense. With this in mind we can appraise correctly the extremely varying manifestations from the point of view of prognosis and treatment.

Of essential facts may be noted first the tubercle bacillus—



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the one common factor ultimately responsible for all the changing expressions of the disease. Next there is the characteristic reaction of the tissues to invasion by the bacillus—particularly the resultant tubercle, of varying appearance according as it is recent or old, according as it is single or agglomerated, according as it is spreading or limited by fibrous barrier.

The seat of immediate localisation in a given case is after all merely an *incident* in the spread of the infection, and must be so regarded in practice. For that reason I have for many years been in the habit of asking students to visualise tuberculosis very much as they visualise syphilis. Admitting that the analogy is not complete, and recognising the gaps in our knowledge, a helpful parallel may be drawn.

### ANALOGY BETWEEN TUBERCULOSIS AND SYPHILIS.

In tuberculosis, as in syphilitic infection, invasion proceeds along more or less definite lines. Once invasion has been successful, there is an infinite possibility of clinical expression throughout months—years—it may be a life-time—unless the invader be choked off.

In both diseases, the period of initial incubation is prolonged and ill-defined. In syphilis, given certain registrable facts, the period of incubation is relatively easy of calculation. The dates of exposure to possible infection are generally traceable, and the first appearance of successful invasion may be definitely determined locally. In tuberculosis, on the other hand, the possibilities of infection are numerous, often obscure, recurrent, and conditioned by environment. The fact of successful invasion is rarely registered in a local sore analogous to the primary sore in syphilis.

Yet cases are on record—and one might add to the record—where the opportunity for direct infection of tuberculosis was afforded at a given date by accident, such as a cut from a broken infected sputum jar, or in carrying out an autopsy on a tuberculous cow, and where a local sore, or warty tumour appeared within four weeks' time.

### PRIMARY LESION.

Whatever we accept as approximately the duration of incubation of tuberculosis in man, it has been definitely

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determined experimentally in various animals, *e.g.*, in the guinea-pig, where following the subcutaneous introduction of T.B., say, in the groin, a local induration—or chancre—appears commonly about the fifth day.

Practically, the study of the primary sore in tuberculosis is more difficult than in syphilis because it seldom occurs on a skin surface. Through a mucous surface the T.B. passes more readily and causes less reactive disturbance. The mucous surfaces being largely hid from view, attention has hitherto been little directed to the point.

Much time and effort have been expended on an attempt to show by what channel the T.B. primarily enters the system. An unnecessarily sharp line has been drawn between inoculation by way of inhalation and inoculation by way of ingestion. The outcome of collective observation seems to be that inoculation of the human subject occurs by varying channels in different cases. While this is so, the great vulnerability of the tonsillar region, including the posterior nares and the fauces, is worthy of special note. The most significant tonsil in the introduction of tuberculosis is not necessarily that which presents most obvious change. In childhood such mucous surfaces are especially absorbent and succulent, and hence doubtless the greater frequency of infection in childhood.

## LYMPHATIC INVOLVEMENT.

Following the primary entrance—wherever that may have been—there succeeds a further period of latency (second incubation). After an interval of time, the duration of which cannot be exactly stated in the human subject, but may be measured accurately in the experimental animal, lymphatic glands become involved, first the glands on the same side and in the vicinity of the point of entrance, then glands at a greater distance on the same side, and thereafter the glands more widely.

This significant glandular involvement is often overlooked no less than the point of entrance. Attention has not been directed sufficiently to its importance.

Yet, from the biological and diagnostic point of view, such multiple glandular involvement ranks as of similar importance to the corresponding enlargement of lymphatic glands in the initial advance of syphilis. In tuberculosis, attention has been naturally riveted on the grossly enlarged and deforming gland

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which has called for surgical interference on a variety of grounds. But the *spreading* involvement of glands is *not* always strikingly obvious. Gross deformity with associated caseation and softening may be entirely absent. The result is that the progressive infiltration of lymphatic glands is missed, *unless* deliberately looked for.

It cannot be too much emphasised that evident caseation and softening, or the gross enlargement which leads to deformity of outline, is an *accident* in the tuberculous process. The accident which frequently calls for immediate local treatment by no means necessarily occurs in the course of tuberculous infection. Attention has hitherto been largely restricted to this more conspicuous but less essential part of the process, and the very success of local measures has unduly limited the outlook on the disease.

The absence of evident gross reactionary disturbance of glands does not mean a less virulent infection or less tendency to spread. On the contrary, clinical observation shows that infection spreads rapidly where the glandular implication remains uniformly slight.

Childhood is the period during which tuberculosis is for the most part acquired. What has been called the infantile type of tuberculosis, where glandular lesions are especially in evidence with gross enlargement and associated changes, is common at that period. But commoner still is the gradual passage of the tuberculous infection by way of the lymphatic system without very striking superficial evidence. If the detection of tuberculosis—especially in children—is to become really effective, the child's glandular system must be most carefully investigated.

### FOCAL LESIONS.

While the disease may seem to be arrested or may run a fatal course at the lymphatic stage—as was illustrated strikingly among the Senegalese troops in France—the infection commonly passes therefrom more widely throughout the system, spreading by continuity of structure or by way of the circulation. Reaching the blood channel either by way of the thoracic duct or suddenly, *e.g.*, by direct passage from a gland into a vein, the bacillus may induce a *focal* lesion almost anywhere, either in bony skeleton or in viscera.

It would take us too far afield for the moment to consider the *wherefore* of local distribution in one structure or organ



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rather than another. It is meanwhile sufficient to note that carriage may be almost anywhere—in one case a widespread dissemination, in another, localised deposits less or more abundant.

In dealing with tuberculosis at this stage, clinicians are apt to restrict attention too much to the localised manifestation whether in lung, abdomen, kidney, or joint. Here again the analogy of syphilis proves helpful. We have to deal with a constitutional infection. The local manifestation is incidental and may be ephemeral. A chief value of the focal lesion is that through its presence we may for the first time recognise with certainty the existence of the infection, either through characteristic local signs or through the discharge of bacilli from the affected area.

## SYSTEMIC INTOXICATION.

The local effects, important as they are, do not constitute the chief or ultimate danger of tuberculosis. The significant factor is the systemic intoxication which sooner or later results from the bacillary invasion. To this intoxication are traceable the more important clinical effects and the fatal termination.

The tuberculous toxines seem to act especially on neuro-muscular structures. Their dystrophic influence is evidenced by loss of sarcous substance and associated irritability of muscle. To these are referable the early manifestations of motor weakness both of limbs and of viscera—the feeling of tiredness, disinclination for effort, softening pulse, and gastro-intestinal sluggishness. These neuro-muscular effects are generally in evidence—even in pulmonary tuberculosis—long before cough or expectoration or other indication of local lesion is forthcoming.

Successful arrest of an existing local process is not everything. The very success of our local measures may be misleading. Scientific caution should forbid a hasty conclusion that the infection has been thereby stayed. Experience of syphilis—prior to the days of salvarsan and Wassermann tests—led to insistence on prolonged surveillance and repeated mercurial and iodide treatment. Even when every possibility seemed to have been met, the syphilitic infection sometimes reasserted itself.

In tuberculosis, we are still much in the position we were with regard to syphilis in these earlier times. We are not

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yet armed with the effective aid of an equivalent to salvarsan in treatment and we are without a blood test of convincing value. We have still to grope our way in relatively uncertain light. The one sure fact is that recurrent manifestations cannot certainly be excluded.

### EFFECTIVE DIAGNOSIS.

What is to be our criterion as to the existence of tuberculosis? The T.B. is far from being always in evidence. Reasons for this readily suggest themselves. For the diagnosis of tuberculosis, we cannot therefore insist on the production of tubercle bacilli as some would demand. Before the days of the *spirochæte pallida* we diagnosed syphilis on clinical evidence with remarkable exactitude. Such evidence is *abundantly* available in tuberculosis.

In addition, tuberculin tests (cutaneous, mucous, intracutaneous, or subcutaneous) are serviceable. They have not been given—as it seems to me—the place to which they are entitled. The subcutaneous test especially—in experienced hands—gives positive or negative evidence of highly important character. A positive reaction indicates at least that the individual has been tuberculised, and may prove much more in a variety of directions. The test which leads to the slaughter or, at least, the exclusion of valuable cattle from accredited herds must not be set aside as untrustworthy or dangerous in the human community.

Although, up to the present time, serological methods have yielded less convincing results in tuberculosis than in syphilis, the outcome of observations from various sides suggests that tests of a sufficient and practical kind may yet be developed—perhaps by way of complement deviation, or by way of agglutination.

While freely admitting the obscurity which still enwraps certain aspects of the problem, we are none the less coming towards the light. With definite knowledge of the essential organism, its life-history, its methods of entrance into the body, characteristic early focal lesions, and the production of toxins with resultant systemic intoxication, we are well on the road towards a scientific conception of tuberculosis which affords precision to procedure in diagnosis, prognosis, treatment, and prevention.

The recognition of the tractability of tuberculosis, if taken

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sufficiently early and sufficiently firmly,—whether in glands, bones, joints, lungs, abdomen—constitutes an advance of first importance.

Early diagnosis and maintenance of suitable treatment for a *sufficient* length of time mean everything. A case once recognised as one of tuberculosis must be kept under surveillance from time to time until there is reasonable ground for believing that the disease has been satisfactorily overcome. Even then, it is a good rule that the subject of tuberculosis should have himself periodically overhauled to exclude the possibility of recurrence.

In this way only are we likely to get rid of the present order of things, when, too late in the day, a large part of most men's time is spent in trying to *patch up* the incurable cases of advanced tuberculosis, whether in the respiratory, genito-urinary, alimentary, or other tract.

## LONG DURATION OF TUBERCULOSIS.

A point of much scientific and practical importance—far from sufficiently recognised—is the extraordinarily prolonged course frequently followed by tuberculosis. In arranging my thoughts for the meeting to-night, I have gone through a pile of records in which, as the papers show, the disease continued under observation for ten, fifteen, twenty years and more. Some of these are cases in which T.B. were discovered more than twenty years ago and have been found at successive intervals up to date. In two cases of lung disease, there is a record of extensive cavitation throughout twelve and twenty years. In some cases, apparently the natural resistance of the individual was sufficient to cope with the invasion apart from special treatment, while in others, continued surveillance, with the repeated institution of appropriate measures from time to time, has succeeded in maintaining the balance in favour of the patient.

The lesson has still to be enforced that *tuberculosis takes a long time to come* and no less certainly *takes a long time to go*. The official three months—doled out to most cases in this country under the Insurance Act—is hopelessly inadequate for the purpose of lasting arrest. For the most part, it is waste of time, money, and effort. The practice is based on a misunderstanding of the natural history of the disease and the needs of the local lesion and systemic infection.

The local lesion can only be repaired by a slow and gradual

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process of cicatrisation, the completion of which *requires* many months, and may require years. The systemic infection demands equal care. The duration of treatment must be determined by the needs of each case, and this calls for skill, experience, and judgment.

Even when such treatment has apparently been successful, a *caveat* should remain in the back of one's mind—and if necessary be expressed—as to the possibility of fresh outbreaks.

### THE PASSING OF TUBERCULOSIS.

With all the difficulties inherent to the problem, and the hopelessness of many a case which the doctor is up against from time to time, some excuse may be pled for the jeremiads to which one is frequently treated regarding the futility of all our efforts against the disease. But are these justified by the facts?

Two thoughts suggest themselves at this point.

### LESSENER MORBIDITY.

The first has reference to individual cases, and here I record my own experience. As compared with the frequency with which, twenty-five or thirty years ago, one saw for the first time cases of far advanced disease for which nothing could be done, such a case is now comparatively uncommon. While there are exceptions, the great bulk of cases one sees nowadays are at a *comparatively* early and tractable stage. This experience is increasing from year to year.

### ACCELERATING DROP IN DEATH-RATE.

The second thought is based on the convincing proof of the preventability and curability of tuberculosis which is given in broad and definite outline by the striking decline of mortality which has occurred in relation to tuberculosis. This is the more significant as it may be safely assumed that, with increasing exactitude of diagnosis, the actual proportion of deaths properly registered has increased.

Fig. 1 shows the death-rate in Scotland per 100,000 of the population from various forms of tuberculosis during the past fifty years. The progressive decline throughout the period is remarkable. A first hasty glance suggests that this decline has been continuous and equal from decade to decade. More



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careful analysis of the curves shows that this is not so. The fall has latterly been much accelerated.

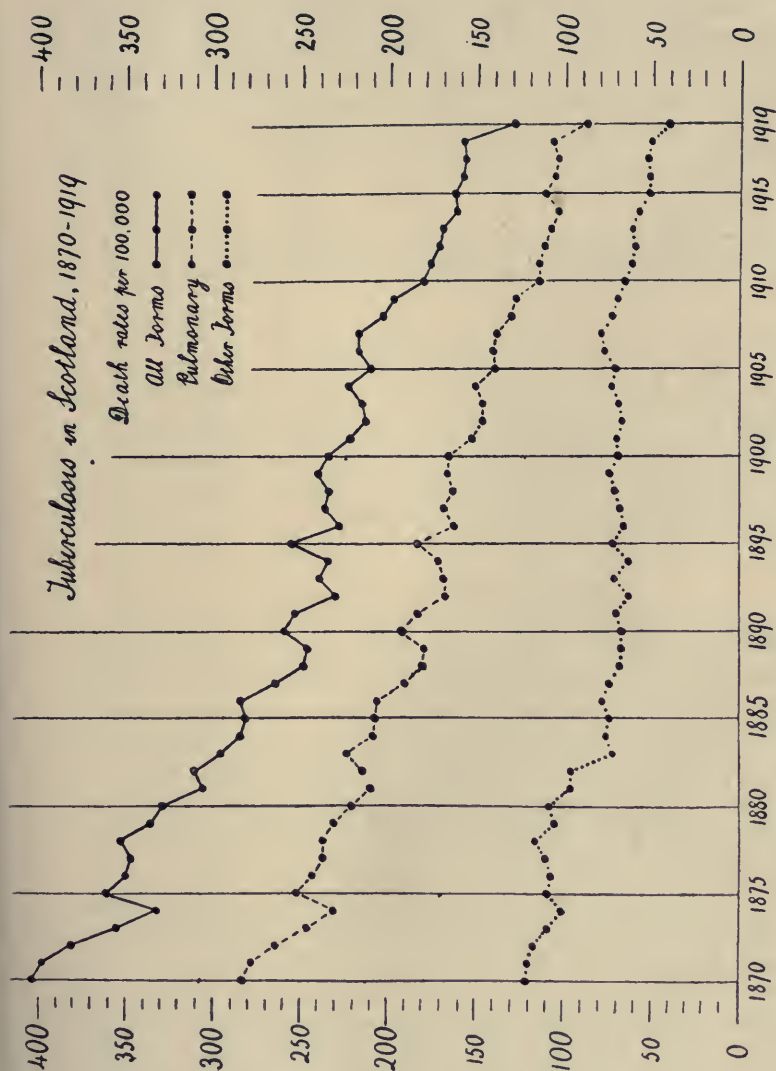


FIG. 1.—Mortality from Tuberculosis in Scotland during the last fifty years.

(Table prepared by Statistical Department of the General Register House.)

Thus taking the first twenty years up to 1890, the *percentage* fall in mortality from all forms was 35, while, during the last twenty years, from 1900 to 1919, the *percentage* fall was 45.



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Fig. 2 illustrates the accelerating drop in death-rate during the last two decades.

Omitting the last five years as being unusual in relation to the War, and taking twenty-five years previous to that, the comparable figures of the mortality from pulmonary tuberculosis in England and Scotland are of interest. In 1890, for England, a death-rate of 168 per 100,000 as against 116 in 1915, *i.e.*, a drop of 30.9 per cent. and, for Scotland, in 1890, a death-rate of 193 per 100,000 as against 111 in 1915, *i.e.*, a drop of 42.4 per cent.

In addition to the fall in the death-rate, it is to be noted that the age at death is gradually being postponed.

### OPTIMISM JUSTIFIED.

Viewed broadly, then, there is ample reason for a sound optimism. Tuberculosis is coming to be understood and handled scientifically. The disease has been dislodged from the opprobrious position it occupied in classic writings. Tuberculosis is successfully arrested every day.

### OBSERVATION AND RESEARCH.

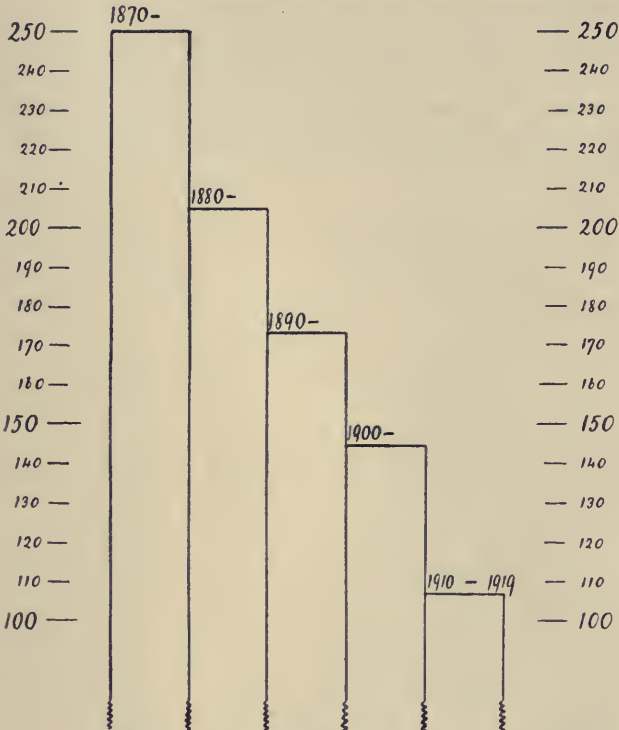
Much remains to be done. There is need for continuous, intensive investigation—clinical and experimental. There are many problems—biological and clinical—pressing for solution. The men who have capacity and material must be given time and opportunity. Care must be taken that their energy is not frittered away on matters which have little interest or value, for example, on mere routine duty which might perfectly well be overtaken by a trained typist or laboratory assistant.

The undergraduate must be trained on modern lines so that whether he develop private practice—medical or surgical—or take a post in the expanding Health Service, he may be in a position to cope effectively with the changing aspects of the disease. His attention must be diverted from the last stage of tuberculous disease, whether in the form of advanced pulmonary, genito-urinary, abdominal, or other tuberculosis, to its completer consideration as an infective process.

Starting from the initial infection, he must be *trained to think of the earliest clinical and pathological manifestations*, their great tractability, and the possibilities which await the

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*Death-rate from Pulmonary Tuberculosis in Scotland in each Decade, 1870-1919*



*Percentage of Decrease for each Decade as compared with Preceding Decade.*

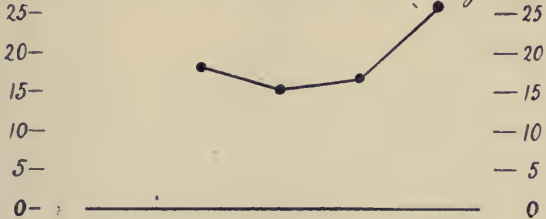


FIG. 2.—Mortality from Pulmonary Tuberculosis, showing accelerating drop in Death-rate during the last twenty years.

(Table prepared by Statistical Department of the General Register House.)

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patient if these are not checked. His earliest object-lesson should be the guinea-pig with its local sore at the point of inoculation, and the gradual spread through the various groups of lymphatic glands to the finished picture when the several viscera are involved.

If thought regarding the occurrence of tuberculosis in the human subject and its further developments be thus guided along scientific lines, we may confidently expect that tuberculosis, as a killing and maiming disease, will be largely out-manceuvred.

## THE CLINICAL FEATURES, ETIOLOGY, AND TREATMENT OF INFLUENZA.

By WILLIAM D. D. SMALL, M.D., F.R.C.P.E., Tutor in Clinical Medicine, Edinburgh University; late Bacteriologist to the 25th General Hospital, B.E.F., France.

THE following account of influenza is based upon more than 2000 cases, admitted to one of the largest General Hospitals of the British Expeditionary Force, France, during the two phases of the epidemic which occurred in 1918. Exceptional opportunities were afforded for observation and investigation, as both ample clinical material and a well-equipped laboratory were available. The opportunities were limited only by the immense number of cases, and by the relative shortage of staff, which meant that there were so many urgent calls upon the time of each medical officer, that many chances of valuable research could not be fully utilised. Nevertheless, while individual cases often could not be investigated with as great completeness as would have been desirable, it was possible to do a considerable amount of research, and to obtain a fairly comprehensive outline of the clinical and bacteriological features of the disease.

The epidemic occurred in two distinct waves, the first extending from April to July, the second from October to December, 1918. In these two separate phases, the disease differed materially in some respects, especially in the relative incidence of the various clinical types, the severity of the infection, the frequency and character of the complications, and the duration of illness.

### (A.) THE FIRST WAVE—APRIL TO JULY, 1918.

Influenza first appeared in the hospital in the middle of April, and commenced in one of the wards set aside for the treatment of "gassed" cases. It spread with great rapidity, and within a few hours practically all the patients in the ward had become affected. In spite of precautions, extension to the neighbouring "gas" wards took place rapidly, and within two days nearly all the "gassed" patients had contracted the disease. This demonstration, furnished at the outset, that those who have been gassed are much more susceptible than normal individuals, was repeatedly verified during the epidemic. Practically every

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patient in a large "gas" ward may become affected within a few hours of the first case being noted, and the period of incubation is always the minimum. Doubtless these facts are explained by the previous injury of the bronchial mucous membrane. The type of influenza, however, does not appear to be influenced, nor does "gassing," except in very severe cases, cause the rate of mortality to be increased.

Within a few days, cases arose in other parts of the hospital, including some among the R.A.M.C. personnel, and large numbers began to be admitted from neighbouring units. The highly infectious nature of the disease and the rapidity with which it spreads are too well known to require description, and it was common to find some of the smaller units practically "cleaned out" in a few hours. The incubation period is extremely short, one to two days as a rule, but often only four to five hours. The path of infection is apparently the respiratory tract.

Following the rule of most infectious fevers, the epidemic was severest in type and in numbers affected at its onset. All the "fulminant" cases (p. 22) with one exception occurred within three weeks after the disease first appeared.

### *Clinical Features.*

The disease occurs in several distinct types, and the clinical features vary accordingly; it must be understood, however, that no hard and fast line of separation can be defined as they may merge one into the other. In order of frequency and therefore of importance, the following are the varieties:—(1) "Simple three-day" type; (2) Pulmonary; (3) "Malarial"; (4) Gastric; (5) Septicæmic or Fulminant; (6) Cerebral.

**"Simple Three-day" Type.**—The onset of illness is very sudden. It is ushered in by a feeling of chilliness and perhaps slight shivering, but it is rare for there to be any definite rigor. Almost immediately intense aching is felt throughout the body and limbs; there is severe headache of a throbbing character, particularly in the region of the temples; and there is often much pain in the lumbar area, and down the front of the shins. There is usually much prostration. In some cases the pain in the back is so severe as to constitute the patient's chief complaint; in others, pronounced shin pains might cause a resemblance to trench fever. The temperature rises abruptly, usually to about 103° F. The pulse is quickened, but not in proportion



# Clinical Features, etc., of Influenza

to the fever, so that it appears relatively slow (90-100). It is full and bounding in character; in severe cases the blood pressure is somewhat low, and the pulse occasionally is dicrotic. A very striking feature of many cases is the instability of the pulse rate, any slight exertion or excitement causing a rapid temporary acceleration. The respirations are only slightly increased (24), unless there be pulmonary complications.

The face is flushed, and the eyes very suffused and slightly bloodshot; photophobia may be troublesome. The flush on the face extending down on to the sides of the neck may give an appearance like an early Rubella. A transient scarlatiniform eruption is sometimes seen on the chest, abdomen, and upper arms, but it is rare. Herpes of the lips is present in a small proportion of cases. The glands of the neck are usually slightly

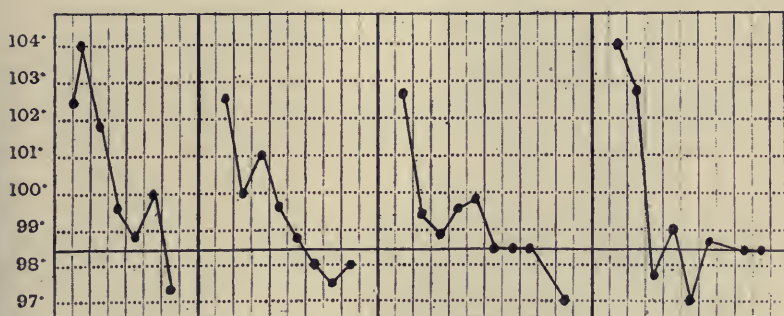
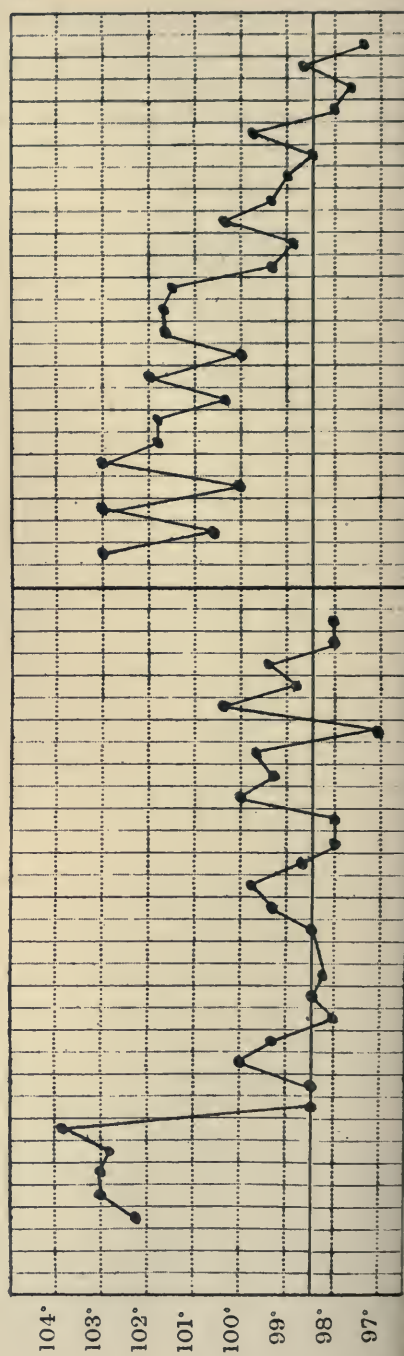
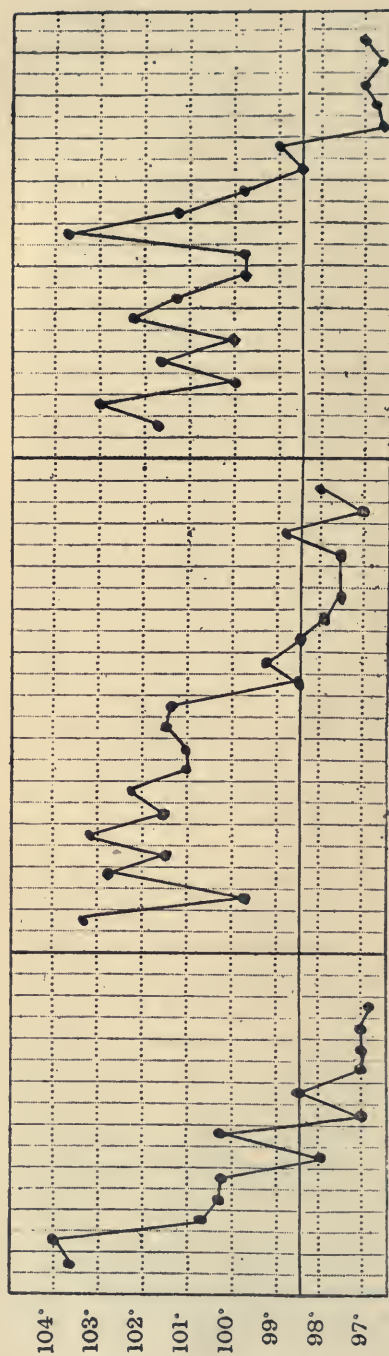


FIG. 1. - Charts from four cases of "Simple three-day" Influenza.

enlarged. Injection of the fauces is common, but sore throat is seldom troublesome; indeed catarrhal symptoms of the upper air passages are strikingly absent; on the other hand a slight degree of bronchitis is present in the majority of cases, giving rise to cough, but in the "three-day" type of influenza, there are rarely any physical signs in the chest. Within twenty-four hours, the temperature commences to fall, and reaches the normal on the third or fourth day; there is almost invariably one slight secondary rise on the day before the normal is attained. The patient is often weak and prostrated for a few days, but most are fit to resume their usual duties within a fortnight.

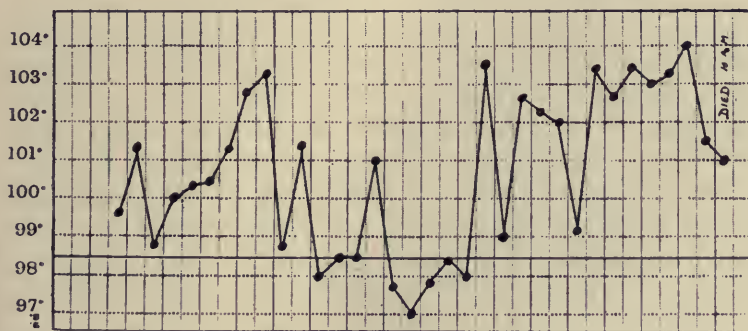
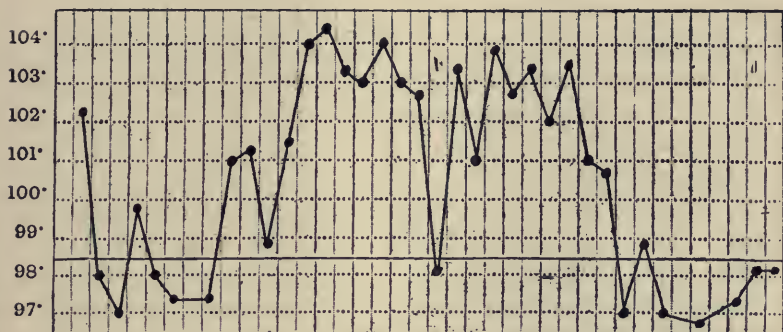
**Pulmonary Type.**—Where the pulmonary manifestations are severe, the course of the disease is materially altered—so much so that a characteristic "pulmonary type" may be



FIGS. 2 and 3.—Five Charts illustrating the varying clinical course in Influenza of the Pulmonary type.

## Clinical Features, etc., of Influenza

described. Any variety of inflammation of the respiratory tract may predominate, and the features of the case depend mainly upon the particular pathological lesion which happens to be present. The patient still suffers from the symptoms of influenza which predominate in the milder three-day form, and even in the pulmonary type the headache and generalised pains—especially those in the back and legs—may be his chief cause of complaint. More generally, however, they are overshadowed



FIGS. 2 and 3.—Two Charts illustrating the varying clinical course in Influenza of the Pulmonary type.

by symptoms directly referable to the chest—such as pain or cough—and there is often associated an extreme degree of toxæmia, and a marked tendency to cardiac instability. Dyspnœa, though evident, is seldom complained of by the patient. Severe bronchitis, dry pleurisy, and bronchopneumonia (which has a great tendency to become confluent), are all common, and may arise either as complications commencing after an initial illness of the typical three-day type, or be



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present from the onset as the principal and primary manifestations of the disease. In a small proportion of cases, they arise after the initial fever has subsided, and are accompanied by a secondary rise in temperature. Lobar pneumonia is much less common, and many cases, which clinically present the physical signs, are in reality examples of a massive confluent broncho-pneumonia.

The characters of the sputum vary with the pulmonary lesion. In some cases it is practically absent; in others it is profuse, frothy, and of the bronchitic type. Frequently it is blood tinged. Or again, it may occur in thick yellowish masses, which may be "specked" with blood; or it may be "rusty," but unlike that of true lobar pneumonia, it is not gelatinous and tenacious, and the red colouration is present from the first; in a few instances, there is profuse hæmoptysis. In the later stages, when consolidation is becoming resolved, the sputum is characteristically seen in large thick greenish nummular masses.

The physical signs again vary with the particular pulmonary lesion. Most commonly they are those of extreme bronchitis and dry pleurisy, and are often so pronounced that they tend to mask the signs of actual consolidation when it is present. Diminished movement, dullness, bronchial breathing, crepitations, increased and altered quality of vocal resonance, may be present where there is consolidation; extensive pneumonia, whether of true lobar type or due to confluent bronchopneumonia, is most marked at the bases of the lungs. A small amount of pleural effusion is present in practically every case of consolidation, but marked pleural effusion is rare. In a proportion of cases some enlargement of the spleen can be detected, and this organ may be tender to pressure. Occasionally there is also tenderness over the liver.

The course of the temperature corresponds to the pulmonary lesion present. In many cases it terminates by crisis about the eighth day; in others it is more prolonged and swinging and gradually falls by lysis, taking about three weeks to reach the normal; many intermediate varieties of termination are seen (see Figs. 2 and 3). Speaking generally the patients are much more severely ill than in cases of ordinary lobar or broncho-pneumonia. From the former a diagnostic feature of great importance is found in the absence of leucocytosis in influenzal cases; in nearly all of these, the white count is not increased, and is sometimes found diminished to a remarkable

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degree (3000 to 4000). A relative increase of large mononuclear cells is not uncommon.

In the cases where the temperature remains high for a prolonged period, a marked degree of emaciation and weakness is produced—so much so that in extreme cases, symptoms of the “typhoid state” may become evident: coma vigil, floccitatio, delirium, subsultus tendinum, and even the facies Hippocratica

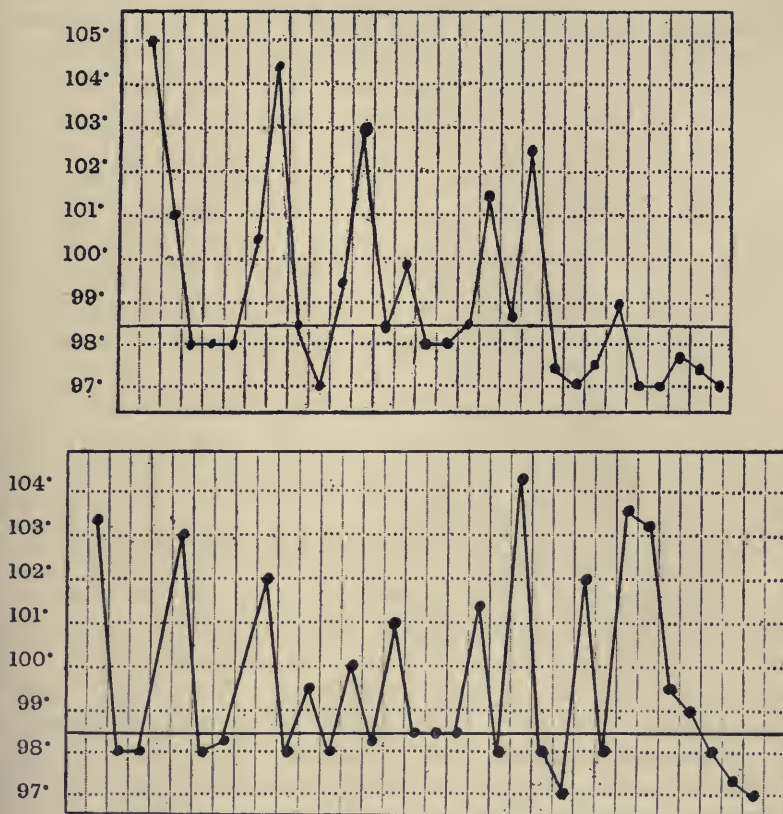


FIG. 4.—Charts from two cases of Influenza of Malarial type.

were all observed; there was also considerable tendency to bed-sores. In these prolonged cases, where much toxæmia is present, diarrhœa may be severe and uncontrollable, and inasmuch as the tendency to cardiac failure is greatly accentuated by movement, this diarrhœa may prove a very dangerous complication. It also adds greatly to the difficulty of keeping the patient free from bed-sores. Owing to the danger of



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establishing diarrhoea, purgatives are absolutely contraindicated in the prolonged cases. The mouth also may become very foul, the lips cracked, and the tongue dry and covered with sordes. During the later stages of many of these prolonged cases irritability is a very marked feature, and still further increases the difficulties of nursing which have just been mentioned.

**"Malarial" Type.**—In a small proportion of cases the temperature is intermittent—days of pyrexia and intermission alternating with more or less regularity, so that the chart resembles very strikingly that of malaria. Each fall of temperature is frequently associated with sweating, and the presence of headache, generalised pains, and sometimes splenic enlargement and tenderness may render the clinical picture very similar to that disease. A marked degree of bronchitis, however, is usually present; the sputum resembles that of the more common types of influenza; the pyrexia is uninfluenced by the use of quinine; and blood examination for the malaria parasite is negative. In a few cases, the intermissions may be more prolonged, so that some resemblance to trench fever is produced.

**Gastric Type.**—During the recent epidemic, the gastric type of influenza was very uncommon; practically all the cases observed occurred in men who had previously been gassed, and who in consequence had suffered from gastric symptoms. In this form, the symptoms are mainly referable to the abdomen. There is usually diffuse abdominal pain and tenderness, and this is often associated with persistent vomiting and sometimes with severe diarrhoea. There is some degree of pyrexia, but the temperature chart is not characteristic. Headache, generalised pains, and some bronchitis may be present as in the simple form of influenza.

**Septicæmic Type.**—The fulminant septicæmic form of influenza is fortunately rare. In its extreme degrees it can be likened only to one disease, namely septicæmic plague, and it is no less fatal. Without any warning the patient is suddenly seized with severe pains in the head, back, and limbs; he may have a rigor, and his temperature rises immediately to about 105° F. He becomes absolutely prostrated, and develops an appearance of the most intense toxæmia. Within an hour or two, his condition is critical; his colour becomes bluish grey, and he develops an intensely offensive odour resembling that of decomposition. The pulse becomes very rapid (130-150)

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and varies in rate from minute to minute, especially on the slightest movement or excitement. Physical signs of severe bronchitis are present, and if the patient live long enough there may be evidence of pleurisy or bronchopneumonia. Sputum is usually absent. In the most rapidly fatal case, death occurred sixteen hours after the onset of illness; in another it occurred within eighteen hours. In both of these the subjects were men of exceptional muscular development, and were previously apparently in perfect health. In these fulminant cases, discoloration of the "post-mortem" type may sometimes be seen in the dependent parts several hours before death.

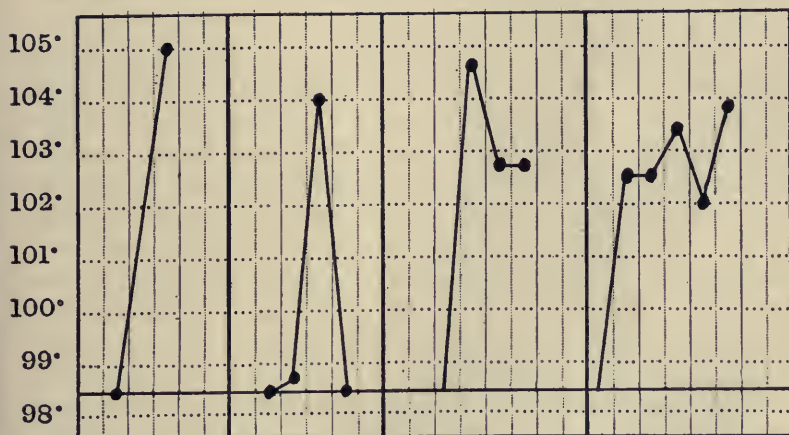


FIG. 5.—Charts from four fatal cases of Fulminant Influenza. The first three were purely of Septicæmic type. The fourth case had, in addition, a large, very acute Pleural Effusion.

**Cerebral Type.**—In about four cases only in this series, the principal symptoms were cerebral, so that a picture was presented not unlike that of epidemic cerebrospinal meningitis. The headache was very intense and was accompanied with head-retraction and rigidity of the neck muscles. The mental state was very dulled and there was more or less delirium: the patient was also markedly irritable, and it was difficult to be certain—from voluntary resistance—whether there was any Kernig present or not. The reflexes were brisk, and in two of the cases there was persistent vomiting. In one instance, so close was the resemblance to meningitis, that lumbar puncture was performed for diagnostic purposes. The fluid

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obtained was perfectly normal, but appeared under slightly increased tension, and the withdrawal of about 20 c.c. was followed by marked amelioration in the patient's symptoms, the vomiting ceasing, and the headache being greatly relieved. The temperature gradually fell, and was normal in about five days.

### *Complications.*

The most important complications are so frequent that it is difficult to decide whether they should really be classed as complications, or whether they should rather be regarded as more usual features of the disease itself. The latter arrangement has been adopted in describing the various types of influenza above mentioned.

The pulmonary complications are undoubtedly the most important. Bronchitis may be regarded as an essential manifestation of influenza, though its degree varies much in different cases. Bronchopneumonia is only a further development. Dry pleurisy is also extremely common, though any degree of pleural effusion is distinctly rare. Empyema followed in a few instances, where there had been evidence of pulmonary consolidation. Lobar pneumonia was clinically not uncommon, though many cases in which this appeared to be present were—as shown by post-mortem examination—examples of a confluent broncho-pneumonia.

The urine was similar to that of other fevers and contained an excess of urates. A small quantity of albumin was often present and it was usual to find casts. Nephritis was rare, and fortunately so, for in the few instances observed the case usually terminated fatally. In two instances only there was much broken-down blood pigment in the urine, during the height of the attack; both were simple cases, and the hæmoglobinuria rapidly disappeared as the temperature subsided. There were no after-effects. Spectroscopic examination was not readily available, and the precise nature of the pigment was therefore undetermined. Abscess of the kidney was discovered post-mortem in one fatal case of influenza.

The profound cardiac weakness which is almost invariably present in the more severe cases is apparently largely due to the direct action of the toxæmia upon the heart, and myocarditis is not infrequently found at post-mortem examination. The heart's action, as already described, is disturbed by very



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trivial exertion or excitement; it becomes much accelerated, and severe, even alarming; dyspnœa may be induced. Where there is pulmonary consolidation or very severe bronchitis, additional strain is thrown upon the right side of the heart, and in these cases cardiac failure is a common cause of fatal termination. No cases of sudden death from cardiac syncope were observed in this series, though instances have been seen by other observers both during the acute stage or in convalescence. In one instance there was an alarming syncopal attack with great cyanosis and dyspnœa a few days after the patient had been allowed up. Occasionally some degree of "D. A. H." persisted for a few weeks after the acute manifestations of the disease had subsided, the patient's chief complaint being palpitation.

Severe and uncontrollable diarrhœa was a complication of many of the severely toxic cases. Although doubtless an effort of nature to reduce the toxæmia, the effect upon the patient was harmful rather than beneficial, from the tendency to bring about exhaustion, dyspnœa, cardiac failure, and sleeplessness. It was usually associated with profound nervous symptoms, especially tremor and head symptoms.

Manifestations of extreme weakness occurred both in the very acute toxic cases, and in others which ran a prolonged course. In the more acute, there was profound prostration and marked general tremor. This tremor is a danger-signal of great importance and an indication of absolute exhaustion. Sleeplessness, delirium, and, if the patient be conscious, a mental state of anxiety of a most exaggerated form, are all usual features of these cases. Many are completely or semi-comatose for days, and after recovery have no memory whatever of what has happened. Coma may persist for several days after the temperature has fallen to normal. In those cases where the course of the influenza tends to be prolonged for several weeks, the manifestations of weakness are those characteristic of the "typhoid state" and to which attention has been already directed. In any form of the disease in which there is much prostration—even in the simple type—nystagmus may be observed, and is doubtless to be interpreted as a sign of muscular weakness.

In a very few of the intensely toxic cases a dusky mottled rash has been observed upon the abdomen—its distribution appearing to correspond to the capillary loops of the skin.

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It slightly resembled in appearance the mottling of typhus. Its duration was very transient, lasting only a day or two. The cases in which it was present, without exception, suffered severely from diarrhœa.

Otitis media occurred as a complication or sequela in a few cases.

Coincident with the epidemic the number of cases of appendicitis admitted to the surgical wards showed a slight definite increase, though the numbers were insufficient to allow of any definite relationship being established.

Temporary depression was not uncommon as an after-effect. There was often considerable debility, but no very marked degree of anæmia.

### *Proportionate Severity and Mortality.*

In this the first wave of the epidemic, it was practically impossible to determine with accuracy the total number of cases treated in hospital. About 800 were directly admitted for influenza or for one of its complications. At the period under consideration, a large proportion of the hospital beds were reserved for the treatment of gassed cases, and in addition to the direct admissions, nearly all of these patients contracted the disease. It was often extremely difficult to determine where the effects of gas ended and those of influenza began, as running of the eyes, fever, cough, bronchitis, and other symptoms were common to both conditions. In all, the total number of cases of influenza was probably not less than 1500.

In this wave the great majority of cases were of the mild three-day type. In only about one-tenth were the pulmonary symptoms in any degree severe, and the mortality was very small. There were only some twelve deaths. Analysing the causes of mortality in these cases, we find that in nine bronchopneumonia was principally responsible: in two of these there was also very marked acute nephritis, and in another there was a large left-sided acute pleural effusion. In all three cases the second condition must be regarded as at least equally responsible for death.

The other three deaths were all examples of the fulminant septicæmic variety of influenza, and death was primarily due to toxæmia. Post-mortem examination showed also intense pulmonary congestion, and microscopically incipient bronchopneumonia was distinctly seen. Most of those who died were



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between twenty and thirty-five years of age. With one exception all had previously apparently been in good health. Five had suffered from the effects of gas, but had either completely or nearly recovered from this before contracting influenza.

### (B) THE SECOND WAVE—OCTOBER TO DECEMBER 1918.

Towards the end of June the number of cases showed distinct diminution, and the first wave had virtually ceased before the middle of July. For the remainder of that month, and until the beginning of October, only an occasional sporadic case was admitted. Early in September word was received that the disease had again reappeared among the Belgian troops, but this time in a far more virulent form. About 10th October the first cases of the second and more severe wave were admitted to hospital, and from that date until the end of December there were in all 986 cases. As in the previous wave, the cases were admitted in the greatest numbers and the disease was seen at its maximum severity, at the commencement of the outbreak.

#### *Clinical Features.*

It was obvious from the first that the type of influenza was much more severe than before. Pulmonary symptoms were much more constant, and even the cases of the simplest type produced greater prostration and ran a longer course than those of the earlier wave. The proportion of severe cases was much higher, and the degree of toxæmia was as a rule much more intense. Delirium, unconsciousness, extreme tremor, cardiac weakness, and broncho-pneumonia were all therefore more frequent symptoms; while the greyish blue or lilac colour of the intensely toxic cases was a common and characteristic feature. The disease was also much more treacherous, and many instances were seen of what appeared to be comparatively mild cases suddenly developing the most virulent forms of the disease. For practical purposes, the cases of this second wave could be divided into two groups:—(1) The Simple Type. (2) The Pulmonary-Septicæmic Type.

**"Simple" Type.**—Owing to the greater intensity of the infection, cases were included among the more simple forms which were distinctly more severe than any so classed in the earlier wave. The symptoms were similar in the main to

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those of the first outbreak, but were more intense. Epistaxis was often early and severe. The patient was much more prostrated during the attack, and lateral nystagmus was almost constantly seen. There was invariably a considerable degree of bronchitis; the pulse was more unstable than before;

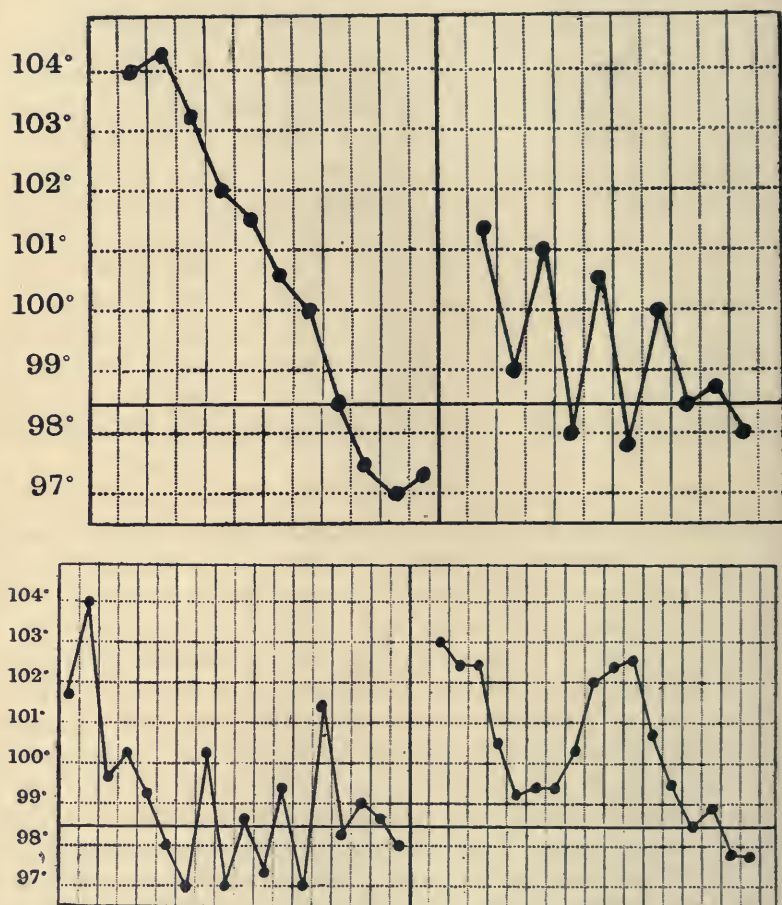


FIG. 6.—Four Charts from "Simple" cases of the second wave.

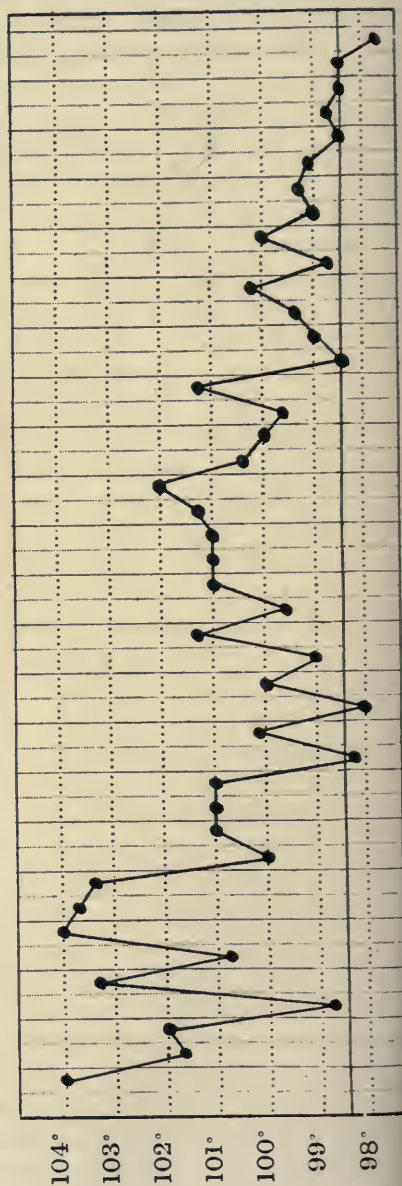
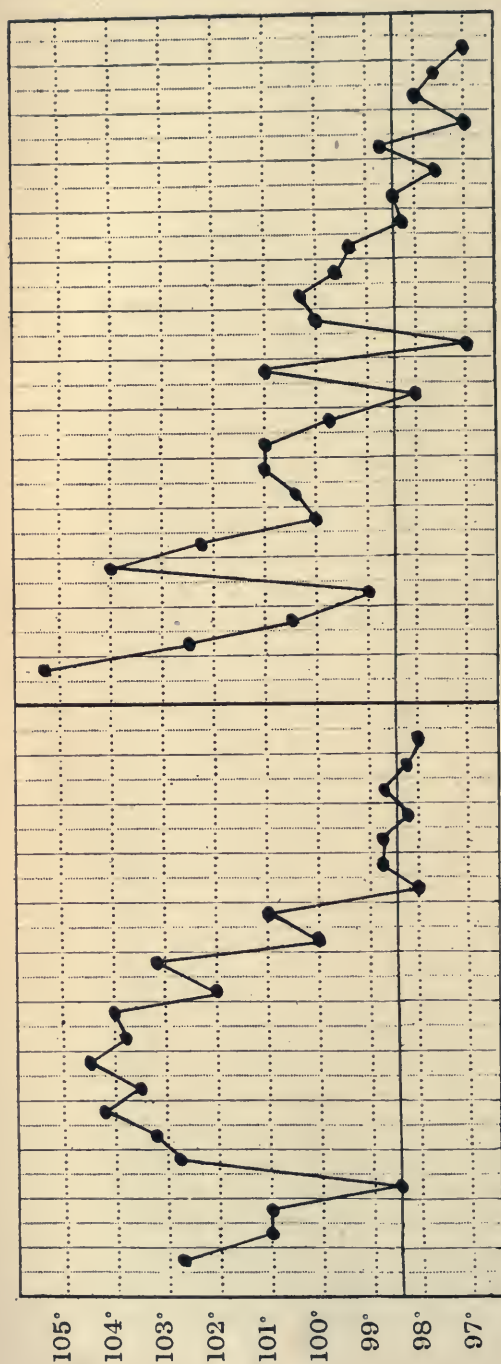
toxæmia was often marked even in these milder cases; and the temperature tended to be higher at the outset, and to take a longer period to reach the normal. The chart was much less typical, and was obviously of a much more septic type, so that there was comparatively little uniformity. The annexed

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temperature charts show the wide variation in cases which showed almost identical symptoms. The degree of debility with which these cases were followed was often severe, even out of proportion to the apparent intensity of the attack.

**The Pulmonary-Septicæmic Type.**—It was not possible as a rule to differentiate rationally between those cases which showed extensive pulmonary lesions and those of septicæmic type, for both features were so constantly combined in the clinical picture. The appearance of the patient was very characteristic, and portrayed an intense toxæmia with absolute prostration. The colour was dusky, and in the severest type was a distinct greyish blue or lilac: these tints were always of serious import, and meant a most acute illness, though a large proportion of the cases recovered. Drooping of the eyelids was a practically constant feature, the pupils were widely dilated, and lateral nystagmus was present. The temperature was high and irregular, of an intensely septic type, and remained elevated for from about ten days to three weeks or longer. Occasionally it terminated by crisis, but more usually by lysis; in many of the most toxic cases, there was a secondary fan-shaped rise which followed the first attainment of the normal line. In the most prolonged case in the series, the temperature continued elevated for nine weeks. (See Figs. 7 and 8.) The pulse was always relatively slow, being usually between 90 and 100, even with a temperature of  $104.5^{\circ}$  F. As before it was markedly unstable, accelerating rapidly with movement or excitement. The respiration rate varied between the wide limits of 24 and 60 per minute, and depended largely upon the degree and nature of the pulmonary affection. The lungs were always severely affected, intense bronchitis and dry pleurisy being the commonest lesions. Broncho-pneumonia was very common, and œdema of the lungs was present in a large proportion of cases. Lobar consolidation was not so frequently found, and pleural effusion—excepting in small amount—was rare. Apart from the toxic appearance, perhaps the most striking feature of this severe type of influenza was the very intense nervous symptoms which the patients presented. In many cases there was more or less complete coma, but always accompanied by great restlessness. When not comatose, the patients always showed extreme anxiety, and apprehension, and allowed themselves no rest. Phlegmatic individuals who took things quietly had a much better chance of recovery than

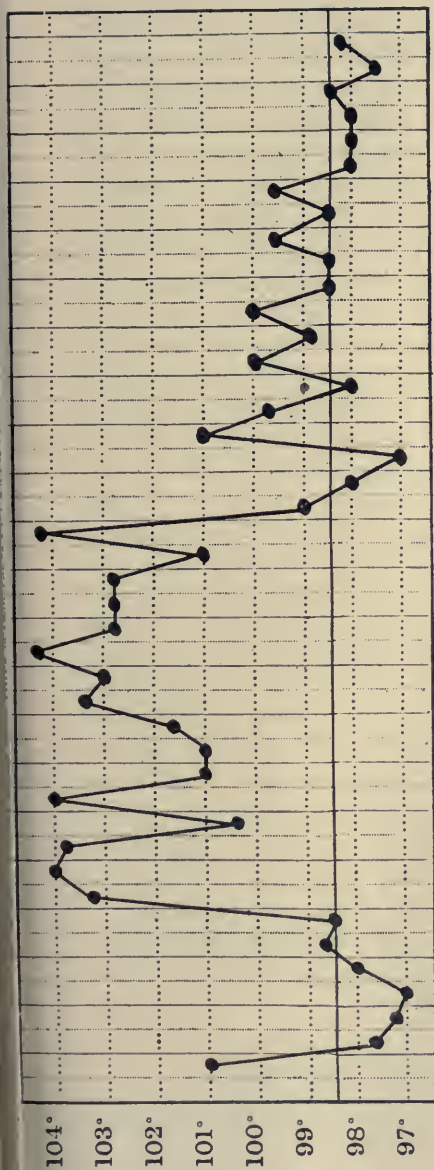




FIGS. 7 and 8.—Charts from three severe cases of Pulmonary-Septicemic type.



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those of a highly-strung nervous temperament. General tremor was seen in a very exaggerated form, and was always regarded as a most ominous sign of exhaustion, and one which demanded no delay in therapeutically inducing sleep. Delirium was often present, and was usually of the mild febrile type of "wandering"; it might, however, be more violent, and occasionally was associated with hallucinations of sight. These patients also had no idea of their environment, and fancied themselves either back with their regiments or carrying out their civil employment. In a few instances great fear of impending danger or violence was expressed. In many of the cases, the type of delirium—with extreme tremor, and hallucinations—was clinically practically identical with that of delirium tremens. The heart sounds were often faint, and in bad cases tended to assume the foetal rhythm: the second sound, in the pulmonary area was usually accentuated. The urine was as before, often diminished in amount, loaded with urates, and containing a trace of albumen and numerous casts.

### *Complications.*

The essential difference between the complications of this and the earlier wave was to be found only in their greater frequency and severity. In nature they were in all respects similar. Broncho-pneumonia, other pulmonary lesions, and toxæmia were much more frequent and severe; the sputum more constantly contained blood and profuse hæmoptysis was common; nervous symptoms were more extreme with coma, delirium, and symptoms of the "typhoid state"; and the tendency to cardiac failure was more often seen. From the severe type of illness and its frequently prolonged course, the debility produced was naturally more severe, and convalescence correspondingly less rapid. Otitis media, diarrhœa, and nephritis did not materially differ in their occurrence from the earlier phase of the epidemic.

### *Proportionate Severity and Mortality.*

Out of the 986 cases which were treated during the second wave of the epidemic, there were twenty-eight deaths, giving a mortality of approximately 2.8 per cent. This includes one case in which there was also a head wound, and in which the apparent cause of death was purulent meningitis, but he had

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also severe undoubted symptoms of influenza. The remaining fatal cases terminated either from broncho-pneumonia or from toxæmia which brought about heart failure, the two conditions usually being combined.

As we have seen, it was really impossible to separate the septicæmic and pulmonary forms from each other, as the two were more or less always associated. Toxæmia, however, was important as a cause of death, and quite a number of the cases terminated fatally after both temperature and pulse rate had fallen considerably, though still above the normal.

In contrast to the first wave, a much greater proportion of the cases showed severe pulmonary symptoms. Their frequency varied as the epidemic progressed, but at the commencement of the wave the pulmonary manifestations were serious in at least one out of every four.

With two exceptions the fatal cases occurred in men between nineteen and forty-one, and practically all were well developed and previously healthy subjects! It was particularly noticeable that the majority of deaths were amongst long service men—those who had served abroad for from two to four years, and who presumably from the strain to which they had been subjected had less reserve power. It was also remarkable how those of the higher physical categories seemed to contract the disease more readily and more severely than less robust individuals.

*(To be continued.)*

## STUDIES ON INFLUENZAL PNEUMONIA AND ITS TREATMENT.

(From the Internal Clinic at the University of Lund, Sweden.)

By PROFESSOR KARL PETRÉN.

(Continued from page 365, Vol. XXIV.)

### ORDINARY LOBAR PNEUMONIA DURING THE EPIDEMIC.

During the period of the epidemic I treated in the hospital 50 cases of ordinary lobar pneumonia (*vide infra*). In these I found 41 cases with albumin and 9 (*i.e.*, 22 per cent.) without, whilst in my cases of influenzal pneumonia 31 per cent. were free from albumin. Fourteen cases of lobar pneumonia showed granular casts, 5 showed red blood corpuscles, whilst in 17 there was no sediment in the urine. The relative number of cases with casts and of cases free from sediment is consequently almost the same as in the cases of influenzal pneumonia. In the cases of lobar pneumonia I found no exception to the rule already mentioned—that albumin disappeared earlier than the fever or, at latest, at the same time as the fever.

The only difference that we find between the urinary symptoms of lobar pneumonia and those of influenzal pneumonia is that a rather high percentage of the latter is free from albumin. I do not venture to express a decided opinion as to whether this difference is merely accidental. In any case, it does not suggest a stronger toxic effect on the kidneys in influenzal pneumonia than in lobar pneumonia, although the former has shown such a high rate of mortality. Furthermore, this difference does not bear out the view that the cyanosis in influenzal pneumonia, often so much severer than in lobar pneumonia, is due to a toxic effect, for then this toxic effect would be much more acute in influenzal than in lobar pneumonia.

I have referred already to the well-marked difference that exists between influenzal pneumonia and ordinary lobar pneumonia, both as regards the history of the disease, especially in the manner of the onset, and in many of the symptoms of the two diseases. I shall not take up space here with enumerating these differences again, and would only add that Professor Sjöevall, who has performed the necropsies on a



# Influenzal Pneumonia and its Treatment

large number of the cases of influenzal pneumonia from my hospital (as well as from others) has arrived at a corresponding conclusion, namely, that the features of the morbid affection of the lungs in these cases of influenzal pneumonia are different from those in ordinary lobar pneumonia. I do not intend to give the details of his observations.

I have also found that, taking the above-mentioned experience concerning the difference between the two diseases as a basis, we can attain to a differential diagnosis between them. During the spring months I saw many cases of ordinary lobar pneumonia and their mortality was high. In consequence I had the opportunity only too often of comparing my diagnosis with that of the pathologist. In general my diagnosis of the two diseases was found correct. I can only remember one case in which a mistake was made, and in that case it is open to discussion whether it would not have been possible to come to the correct diagnosis if closer attention had been paid to the rules already formulated. In any case, we know that there scarcely exist two diseases in the same organ between which a clinical observer does not at times err, and I do not think that the difficulty in making the clinical diagnosis between influenzal pneumonia and ordinary lobar pneumonia is greater than it is between many others.

Warfvinge, who has given a very good description of the former great influenzal epidemic in Sweden (1889-90), also believes that one can usually make the diagnosis between influenzal pneumonia and ordinary lobar pneumonia with certainty. Both Warfvinge and Wallis, who was then pathologist to the same hospital in Stockholm, reported that ordinary lobar pneumonia was rare in Stockholm at the period of the influenzal epidemic of 1889-90. On the other hand, Leichtenstern tells that in the same epidemic the number of cases of ordinary lobar pneumonia was said to have been greater than usual in places so different as Paris, Berlin, Vienna, Moscow, and Boston. In the present epidemic Fleischmann speaks of a rise in the number of cases of lobar pneumonia. In English authors I have found no mention of the number of cases of lobar pneumonia having increased during this epidemic.

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The following figures give my experience on this question :—

During	Cases of Influenzal Pneumonia treated in my Clinic.	Number of Deaths among these Cases.	Mortality.	Cases of Ordinary Lobar Pneumonia treated in my Clinic.	Number of Deaths among these Cases.	Mortality.
1918.						
July .	1	...	...	...	...	...
Aug. .	2	2	...	...	...	...
Sept. .	52	26	50%	...	...	...
Oct. .	65	24	37%	1	...	...
Nov. .	60	16	27%	2	1	...
Dec. .	49	16	33%	1	...	...
1919.						
Jan. .	42	7	17%	3	2	...
Feb. .	9	1	...	4	2	...
Mar. .	5	1	...	14	2	...
April .	9	2	...	14	4	...
May .	4	3	...	10	1	...
June .	0	...	...	1	...	...
July .	1	1	...	...	...	...
Total .	299	99	33%	50	12	24%

As one may see from these figures lobar pneumonia was rare during the whole epoch in which the epidemic of influenza was at its highest, but that the number of cases of the disease was large just at the time when the epidemic of influenza definitely decreased. To make comparison possible, the following figures show the number of cases of ordinary lobar pneumonia treated in the clinic and the deaths from that disease for the five years 1913-17 :—

Year.	Number of Cases of Ordinary Lobar Pneumonia treated in the Clinic.	Number of Fatal Cases among them.	Mortality per cent.
1913	43	6	14
1914	51	3	6
1915	66	9	14
1916	60	20	33
1917	33	5	15

It will be seen that the number of cases of lobar pneumonia was not excessively large, but that the mortality from the disease during the epidemic of influenza and during the months immediately following was greater than usual, although in one preceding year (1916) the mortality was even higher.

# Influenzal Pneumonia and its Treatment

## THE COMPLICATIONS OF INFLUENZAL PNEUMONIA.

As regards the complications of influenzal pneumonia I shall only say a few words. We saw about thirty-five cases of *pleurisy* with serofibrinous effusion and twenty-two cases of *empyema*. It is to be remarked, however, that a few cases of pleurisy were sent to the hospital on account of the pleurisy itself, so that the percentage of pleurisy observed in the cases of influenzal pneumonia treated by me is slightly too high. I consider that the number of these complications is not relatively great, and I am inclined to think that they are more frequent in ordinary lobar pneumonia, but I do not venture to express a definite opinion on this question.

As to the symptoms of the pleurisy, it has seemed to me striking that auscultation has yielded very uncertain indications of effusion (more so here than in other cases), and, consequently, that for the diagnosis one must rely entirely on percussion together with X-ray examination.

Concerning the treatment of empyema, we have come to the same conclusion as so many of our colleagues (for instance, Vermehren in Copenhagen and many others), namely, that one should not perform resection of ribs too early, but should first try simple aspiration of the chest, and resect a rib, if necessary, later on when the pneumonia has passed away. During the first part of the epidemic I advised operation immediately on discovery of an empyema. But our experience of this method of treating such cases was not favourable, and my colleague, Borelius, Professor of Surgery, came to the same opinion as I have expressed on this question. With the deferred operation the results were better, and I have seen some cases which recovered without any operation.

I have not seen gangrene of the lungs in any case after influenzal pneumonia, and can only conclude that the tendency to this complication is not great.

I have seen *subcutaneous emphysema* in one case, a girl aged thirteen. Hopkins has observed one case of this kind, but Thayer speaks of several. Donald J. Frick has seen ten cases, and Abrahams, Hallows, and French have observed fifteen, and only one without a fatal termination. The autopsy of my case did not show a subpleural rupture as the cause of the emphysema.

*Pericarditis* was observed in four cases. Whittingham has

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reported one case of this kind, but James J. Carr has observed many of them. From my observations I am led to conclude that the infection has a tendency to attack the pericardium.

I shall speak later of the cardiac complications of influenza.

*Otitis media* we saw in six cases only. Operation was indicated only once, and in that case a cholesteatoma was found. Therefore this complication has not been frequent, and when it did occur it was benign. Formerly, the general opinion was that otitis media was a very frequent sequel to influenza, but this has not been confirmed in the late pan-epidemic.

I have seen one case of laryngitis suppurativa which ended fatally.

I have not seen many cases of complications affecting the nervous system.

In one case—the severe headache having given rise to a suspicion of meningitis—we performed lumbar puncture. In this case diagnosis of serous meningitis seemed to me to be fairly probable, and the cerebrospinal fluid showed a rise of pressure to 200 mm., but no augmentation of the cells, and at the autopsy hyperæmia of the meninges was found.

On one occasion we saw a complication with an ulcerative endocarditis and a secondary meningitis suppurativa.

I have seen one case with paresis of the feet (which soon disappeared), in which we could not decide if it were due to poliomyelitis or to influenza with a slight encephalitis. The latter diagnosis seems to me to be the more probable.

Further, I have seen one very severe case in a man aged twenty-four, where a deep coma had developed, and where death seemed to be almost certainly impending, but from which he slowly awoke, with, however, hemiplegia and total aphasia. I cannot say whether there had been hæmorrhage of the brain or some infectious arteritis.

In one other case, a woman of twenty-nine, we observed a deeply comatose condition with a suspicion of cerebral hæmorrhage. An anatomical examination of the brain gave, however, a completely negative result. I can come to no other conclusion than that the influenzal pneumonia in this case exercised a very strong toxic effect on the brain. The case is in my experience quite unique, and I have not found a description of any other resembling it.

It is also possible that during the influenzal pneumonia she had fallen into a catatonic condition, though she had not shown any mental symptoms previously.

My general impression apart from these cases has been that the toxic effect on the brain is not great. It is true that



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patients very often show diminishing psychical liveliness and strength when the cyanosis is severe, and they are nearly suffocated, but that can be explained by the dyspnœa in these cases, and the fact that they are completely occupied by the difficulty of getting the necessary air, and I have seen no other cases the study of which has led me to infer any markedly toxic effect on the brain.

Particulars of the history of these cases of affection of the nervous system (the case with aphasia and hemiplegia excepted) are published in Swedish.

## EXPERIENCE AS TO THE COURSE OF THE DISEASE AND THE PROGNOSIS.

The time which the disease has taken in the different cases is given in the following table. In the cases which survived I have reckoned as the end of the disease the time when the fever ceased.

*Time which the Disease has taken.*

Number of Days that the Disease continued.	During the first epoch of the Epidemic (September-October).			During the later epoch of the Epidemic.			Total Mortality per cent.
	Number of Cases which Survived.	Number of Deaths.	Mortality per cent.	Number of Cases which Survived.	Number of Fatal Cases.	Mortality per cent.	
Not more than 5 days	11	8	42	1	2	67	45
6 to 7 "	8	11	58	9	6	40	50
8 " 10 "	12	19	61	24	15	38	49
11 " 14 "	13	7	35	23	10	33	32
15 " 19 "	9	7	44	15	2	12	27
20 or more "	8	1	12.5	60	5	7.5	8
Total	61	53	47%	132	40	23%	32.5%

In this table I have taken from a paper originally published in Swedish the figures that belong to the two first months of the epidemic (September-October) and have added the figures for the whole of the latter part of the epidemic. I have done this because the comparison is well fitted to show the change that occurred in the character of the epidemic.

If we examine the figures for the first epoch we see that the disease usually lasted a shorter time—about one or two weeks. In considering these figures one must remember that in the

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cases which have the shortest course (not more than five days) we have cases of totally different types: both the mildest cases which have recovered after a very short time, and the most serious cases where the patients have died in a very few days.

If we combine the surviving and the fatal cases of the two first months (the difference between them is on this point only very slightly marked), we find that 33 per cent. of all the cases ended one way or the other in one week and 78 per cent. before the close of two weeks.

Within two weeks death occurred in 85 per cent. of the fatal cases, but among the surviving cases the fever had ceased in only 72 per cent. (for the first week the difference between the corresponding figures is smaller: 31 per cent. for the surviving and 36 per cent. for the fatal cases). When we consider the cases with a course of more than twenty days this difference is very great; death only occurred in one case so late (2 per cent.), but among the surviving cases the fever in 13 per cent. continued an equally long time.

One can certainly say that cases of influenzal pneumonia at that period ran a short course, and where the case was fatal death generally occurred in a short time.

When we examine the figures for the whole later epidemic we see a very great difference as regards the length of the disease, as the course of the cases has been much longer. Here the difference between the surviving and the fatal cases is so large that it could only be misleading if we combined them. The change in the length of the disease is evident already in fatal cases: death occurred during the first week in only 20 per cent., but within the first two weeks in 82.5 per cent. This ratio is almost the same as during the first epoch. In 12.5 per cent. it took place later than the twentieth day. The greater length of the disease is, however, more marked in the surviving cases. Among these the disease ended in one week only in 7.6 per cent. and in two weeks only in 43 per cent. It continued more than twenty days in 45 per cent.

We find that this change in the character of the disease as shown by the prolongation of its duration is really very marked. We also observe another change in the character of the epidemic, viz.:—that the mortality has been much less during the later period of the epidemic. This fact is even more clearly exhibited in the table showing the occurrence and course of the cases in the different months, where we see

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that this change in the character of the disease had already appeared in October, but was more marked in January.

There remains for consideration *the influence of the age* of the patients on the prognosis, and along with this I shall, for practical reasons, treat of the question of the age-distribution of the cases. I have here included thirty-nine cases treated by my colleague, Carstens Johannsen, at the hospital for infectious diseases in Lund, as they belong to the same epidemic and the same territory as my own cases, and I offer him my best thanks for his courtesy in placing them at my disposal.

*Table of the Number of Influenzal Pneumonia Cases occurring at different ages, and the Mortality at these ages.*

Age.	During the first epoch of the Epidemic (September-October).*			During the whole later part of the Epidemic.			During the whole Epidemic.		
	Number of Cases treated in the Hospitals.	Number of Deaths among them.	Mortality per cent.	Number of Cases treated in the Hospitals.	Number of Deaths among them.	Mortality per cent.	Number of Cases treated in the Hospitals.	Number of Deaths among them.	Mortality per cent.
13 to 19	21	7	33	24	8	33	45	15	33
20 „ 24	63	32	51	43	5	12	106	37	35
25 „ 29	35	10	29	34	10	29	69	20	29
30 „ 34	34	11	32	34	5	15	68	16	24
35 „ 39	11	5	45	19	7	37	30	12	40
40 „ 44	6	2	33	11	3	27	17	5	29
> 44	2	1	50	10	6	60	12	7	58
Total .	172	68	39.5	175	44	25	347	112	32

\* The figures do not quite correspond with those in the previous tables as to the frequency and the mortality in the different months, as I have here included the cases of Dr Carstens Johannsen. This was not done in the other tables.

Among these cases there are no children, as children are not treated in my clinic, but in other wards of the hospital.

The Table shows for the first epoch of the epidemic facts which have already been suggested in many other papers, viz., that the greatest incidence of the disease occurs between the ages of 20 and 24 years, and also that the mortality is highest at these ages.

When we come to the figures for the later part of the epidemic, we find, on the contrary, that the mortality is low for this period of life, but the number of cases is still relatively great, and greater than for any other age. The number of my



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cases is so large that I am constrained to believe that this striking difference in mortality between the two periods of the epidemic is not accidental; consequently, I conclude that the lower mortality for this age in the later epoch of the epidemic is due to a changed character of the disease.

Between the ages of 25 and 44 years one sees some variations in the mortality at different ages, and also at given ages between the two epochs of the epidemic (especially for the ages 30 to 34), but I believe that these differences are only accidental. Further, we note a marked decrease in frequency of the disease from the age of 35 years, a decrease which is still more accentuated as we come to higher ages.

When we take the cases in the higher ages into consideration (that is, in those over 44) we find a very high mortality. The number of these cases is small, and one might conjecture that the increase in mortality might be an accidental result of the small numbers. Under observation it seems to me, however, more probable that this difference is a real one. (If we compare the two epochs of the epidemic we find another difference with regard to this age besides the number of cases having increased in the later epoch.)

The results of my investigations up to this point may be briefly stated as follows:—(1) The frequency of the epidemic is greatest between the ages 20 and 24; (2) the frequency is great at all ages from 13 to 35. It must be noted that in my clinic children are not included, hence the lower age only refers to my own observations; (3) after the age of 35 the number of cases decreases, and after 45 there are only a few cases, but in the later epoch of the epidemic the reduction was less marked.

As concerns the earlier period of the epidemic I can confirm the general opinion that the mortality is highest at the ages of 20 to 24, but this does not hold for the later epoch of the epidemic. On the other hand, the few cases over 45 years of age show the highest case-mortality.

If we try to explain these differences from a theoretical point of view, we must first remember that my analysis indicates that the great danger of the disease must be primarily sought in the fact that the morbid affection in the lungs spreads rapidly, and leads to such a confluence of the primary foci that there is no longer sufficient lung tissue for adequate respiration, and, consequently, suffocation ensues. The fact that the prognosis



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in the later epoch of the epidemic was better, indicates that this tendency to rapid extension of the changes in the lungs was no longer so strongly pronounced. It is in perfect accordance with this idea that severe cyanosis and a violent purple colour of the face was much less frequent in the latter part of the epidemic.

As we have seen the mortality in the first period to reach its maximum between the ages of 20 to 24, we conclude that certain conditions must be specially developed in these ages which render the human organism less resistant to the tendency of the morbid affection to spread in the lungs. When this tendency, in the latter epoch of the epidemic, has no longer been as strong as before, the prognosis for these ages becomes the same as for the other ages. As to the exact nature of the conditions in the organism, which confer a greater or lesser power to resist the spreading of the affection in the lungs, we know nothing with certainty.

The higher ages have not often been attacked, but, if attacked, these patients have offered very little resistance to the disease. Whether this is a consequence of widespread pulmonary involvement or of a greater tendency to cardiac failure we cannot decide.

If we compare our results with the experience of Warfvinge from the older epidemic (1889-90) in Stockholm, we find that he observed *forty-eight* cases between the ages of 20 and 40, but only *twenty-one* between 40 and 60, and *three* after 60. For the latter period of this epidemic (when the higher ages were more attacked than in the first period) I find that the corresponding figures are 154 cases between the ages of 20 and 39, and 21 for all the higher ages. Linroth has made extended researches on the former epidemic in Sweden, collecting his figures from statistics supplied by Swedish doctors who recorded their experience in families whose different members were personally known to them. Collecting such figures from the doctors in all the towns of Sweden, he found that 59.6 per cent. of the population between the ages of 20 and 40 had been attacked in Stockholm by the disease and 59.3 per cent. in the other Swedish towns. Between the ages of 41 and 60 the corresponding figures were 53.7 per cent. in Stockholm and 65.9 per cent. in the other towns. For the ages of 60 and over, the corresponding figures were 39.3 and 45.8 per cent.

On comparing the figures of Warfvinge and Linroth with

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each other, it must be remembered that the figures of Warfvinge are taken from the cases of influenzal pneumonia treated in hospital, but those of Linroth include "uncomplicated" cases of influenza, that is to say, the milder cases treated at home. For other countries statistics exist of the older epidemic which correspond fairly closely with those of Warfvinge and Linroth in respect to the upper age-limit of the disease.

On the other hand, if we compare the figures of Warfvinge and Linroth with my experience as to the distribution of the influenzal pneumonia at different ages, we see a great difference, inasmuch as these older authors have found the disease very common at the higher ages, whereas we have seen only some few rare cases.

This difference between the two epidemics has already been noted by many authors, and for my part I accept an idea which has already been expressed, that the cause of this difference must be sought in the different intervals between the latest epidemics of influenza; between the two latest only twenty-nine years elapsed, but the period between the epidemic of 1889-90 and the next preceding (1836) fifty-three years—a longer interval. I am not sure whether we should suggest 1837 or 1847 as the year for the next preceding pandemic (Hirsch). In any case the interval had been at least forty-two years. These figures suggest that after the disease there remains an immunity, and that the immunity following the epidemic 1889-90 has made all the higher ages less susceptible to the disease, a state of affairs which could not hold to the same extent for the epidemic 1889-90, when forty-two or perhaps fifty-three years had intervened since the former epidemic.

But if we accept this explanation we are forced to the conclusion that the ordinary "influenza," of which we have seen small epidemics every year since 1890—that is to say, ever since the doctors of our time have begun to pay attention to the clinical picture of the disease—has been something quite different from the pandemic of influenza during the years 1889-90 and 1918-19. According to this view, the symptomatic resemblances between the two diseases, "pandemic of influenza" and "influenza nostras," would be quite accidental, the maladies themselves being, in reality, two totally different "species of disease."

If we pay attention to the subsequent history of the surviving cases, it is well known, and I have already referred

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to it, that a certain number of them are attacked later by pleural effusion, either serofibrinous or purulent. But if we disregard this complication, which is also frequent in ordinary lobar pneumonia, I must emphasise as my general impression that one sees very few complications in the disease, the most frequent, apparently, being pericarditis, which is closely related in its essence to pleurisy. And although the course of the disease varied much in duration in different cases, I do not find that the convalescence has, as a rule, followed a very irregular course.

At the very time when the epidemic was most severe in the autumn, it was quite striking that many of the patients, as soon as they had been free from fever for only a few days, wished to get up, and when this was allowed they stood it well. It has been shown above that the course of the disease, as indicated by the duration of fever, in the later period of the epidemic was in general longer, and perhaps also convalescence then began to be more protracted, but I am not quite sure on this point. In any case most of the patients recovered completely in a short time, although many others suffered from exhaustion for a long time and were slow in regaining their accustomed vigour.

But if we disregard the later cases, it seems astonishing that one has seen so few instances of any disease that can be considered as a sequel of influenzal pneumonia.

## OCCURRENCE OF HYPERFUNCTION OF THE THYROID GLAND AFTER INFLUENZAL PNEUMONIA.

With the exception of the ordinary type of general weakness and lack of strength, I have only seen one clinical feature—to a certain degree a specific picture—that I can consider as a sequel to influenzal pneumonia. I shall report, very briefly, four histories of this kind.

(1) A married woman, aged 27 (1919: No. 484), entered the clinic on 4th March 1919. Influenza in October 1918, six days in bed, fever only 100.5° F. Thereafter healthy for three weeks, then she began to suffer from palpitation which was independent of movement, and occurred equally during the day or night (but not every day), but which did not prevent her from working. No dyspnœa. On 30th December, after retiring to bed, she felt very severe palpitation which subsequently recurred whenever she sat up in bed.



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In the clinic we found no evident physical signs in the heart, and X-ray examination was negative, but she showed a too high pulse-rate, which during the first week generally lay between 90 and 100. The thyroid gland was a little enlarged. Some tremor of the hands. White blood corpuscles 6000, 20 per cent. lymphocytes, 73 per cent. neutrophils, and 2 per cent. eosinophils. After treatment for some weeks in the clinic, her heart-frequency became almost normal.

(2) An unmarried woman, a teacher, aged 33 (1919: No. 593), entered the clinic on 17th February. This patient had been treated in the clinic previously from 26th November 1918 to 7th January 1919 for severe influenzal pneumonia, and suffered during that time also from slight mental aberration. Thereafter she had been nervous and restless, suffering from headache which had increased during the last three weeks, from palpitation, and from pains in the region of the heart. Sleep not good; perspiration very much increased.

At the clinic we found the pulse-rate between 80 and 100. Examination of the heart by X-rays showed no distinct pathological changes. A systolic murmur was audible over the whole præcordia—most marked in the pulmonary area. An electro-cardiographic examination yielded no marked evidence of any pathological condition. The thyroid gland showed a diffuse, slight enlargement. Tremor of the hands. The white blood corpuscles, 13,800; the lymphocytes 28 per cent.; the leucocytes, 72 per cent. She was kept under treatment for seven weeks, but with no improvement.

(3) A married woman, aged 30 (1919: No. 357), entered the clinic on 10th February 1919. She had suffered in October 1918 from influenza, and was in bed for two weeks. After she had been up for one week she had a severe attack of palpitation, with pains in the region of the heart, which continued for one hour. On the following night a further severe attack. She remained in bed and had no special symptoms until she entered the clinic for the first time on 11th November 1918.

She had at that time a pulse-rate of 120. No evident physical signs from the heart; X-ray examination negative; no evidence of any pathological condition on electro-cardiographic examination. At that time I thought of the possibility of myocarditis and kept the patient for six weeks in bed under digitalis. The pulse was, to a certain degree, resistant, and the rate remained between 90 and 100.

On 24th January a severe attack of palpitation occurred (at home) in the night and lasted for five minutes, after which she was ordered to bed for eight days and thereafter was sent to the clinic by her doctor.

There we found that the pulse-rate was between 80 and 90; the heart as before; some tremor of the hands and tongue; the white



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blood corpuscles in different counts between 5800 and 7300; the lymphocytes 40 per cent., the neutrophils 56 per cent., the eosinophils 2 per cent. One week later the lymphocytes were only 36 per cent.

The symptoms improved only slightly whilst patient was in the clinic.

(4) An unmarried woman, aged 29 (1919: No. 486). Entered the clinic on 4th March 1919. In December 1918 had influenza. Before that time had occasional stomach disturbance. She was kept in bed for ten days; fever not over 100.8° F. After the influenza weak and tired, nervous and restless; headache and palpitation almost every day; often lachrymose.

The pulse-rate was between 80 and 90. X-ray examination showed that the heart was rather small, slight systolic murmur at the apex; otherwise no definite pathological evidence from the heart.

The thyroid gland enlarged. Evident tremor of the hands and tongue. The white blood corpuscles at different counts between 7700 and 8100; the lymphocytes 24.5 per cent., the neutrophils 62 per cent., and the eosinophils 4.9 per cent.

The patient did not improve in health whilst she remained in the clinic.

These four histories have much resemblance to one another. The characteristic clinical features are the palpitation and the history of the attacks, the high pulse-rate with no other heart symptoms, the tremor of the hands, the slight enlargement of the thyroid gland in the three cases; in one case also increased perspiration; never exophthalmos. These symptoms evidently indicate a hyperfunction of the thyroid gland. Under these conditions it is striking that in the blood-counts we found only a low rate of lymphocytes—in one case only (No. 3) 40 per cent., all others below 30 per cent.

In correspondence with this view as to the nature of these cases I have treated them by rest in bed, X-rays, Nauheim baths and bromides. From the histories one can see that the disease was not much influenced by this treatment. One must remember, however, that in treatment of hyper-thyroidism with X-rays some months must elapse before marked improvement takes place. Hence, it is too soon to form an opinion as to the ultimate fate of the cases.

On considering these cases I must, however, emphasise that they suggest a type of hyperactivity of the thyroid gland that is not associated with that increase in the relative number

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of lymphocytes which is found in ordinary cases of Graves' disease, and it has seemed to me of interest to examine their character more closely by employing the ordinary methods which are used in studying the reactions of the visceral nerves as detailed by Eppinger, Hess, and many others.

We therefore gave injections of pilocarpine (0.01 g.), of atropine (0.001 g.), and of adrenaline (0.001 g.), the last being given one hour after administration of 100 grammes of glucose by the mouth. The results of these experiments are recorded in the following table:—

Case.	Pilo- carpin.	Adrenalin after 100 gram. Glucose.		Atropine.		
No.	Perspira- tion and Salivation lasting	Pulse-rate rising from	Blood Sugar rising from	Pulse-rate rising from	Dryness in the Throat.	The Pupils.
1	1 hour .	85 to 112 .	0.079% to 0.21%. 3.8 gram. Sugar in urine.	80 to 126 Palpitation.	Dryness in the throat.	Large, but reflex normal.
2	1 hour .	...	0.078% to 0.20%. 5.7 gram. Sugar in urine.	88 to 107 Palpitation.	Dryness in the throat.	A little en- larged and reflex slow; this phenomenon persists in the afternoon.
3	3 hours .	91 to 119 .	0.11% to 0.17%. 5.2 gram. Sugar in urine.	91 to 120 Palpitation.	Dryness in the throat.	Enlarged and difficulty in reading; these phenomena no longer present in the evening.
4	Present, but not strongly, lasting 1 hour.	92 to 106 .	0.08% to 0.245%. 4.8 gram. Sugar in urine.	83 to 108 Palpitation.	Only to a slight degree, but it persisted for the whole day.	Greatly en- larged; the phenomenon persisted in the evening, but not on the next day.

This table shows us that there exist neither marked vagotonus nor sympatricotonus, but that both the autonomous and the sympathetic nerves have shown a very lively reaction to all the means here used. This result coincides with my researches published some years ago, in which I point out that marked individual differences occur and that in some individuals

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both the autonomous nerves and the sympathetic react well, whilst in others both sets of nerves react only feebly or perhaps not at all.\*

Our results indicate, therefore, that after influenzal pneumonia a condition of hyperfunction of the thyroid gland may occur, and that it is associated with many of the ordinary symptoms, though exophthalmos and the rise in the relative number of lymphocytes in the blood are absent. Our examination proves that these cases are neither instances of vagotonus nor of sympaticotonus, for they have reacted promptly both to pilocarpine and atropine, and also to adrenaline.

Some years ago Bertelli, Falta, and Schwerger, as the result of their researches, expressed the opinion that agents which have a tonic effect on the sympathetic nerves should cause an augmentation of the neutrophils with hypereosinophilia; but that the agents with tonic effect on the autonomous nerves should as a sequence have a hypeosinophilia and a rise in the number of lymphocytes. After the above injections we made differential counts of the blood, but the results have proved irregular, and show no trace of a regular rule; I shall therefore give no figures.

\* It may be recalled that Eppinger and Hess published a paper in which they emphasised the fact that some individuals show a reaction more especially to drugs which influence the autonomous nerves, that is to say, to pilocarpine and to atropine (vagotonus), whilst others respond to adrenalin, which acts on the sympathetic nerves (sympaticotonus). So far as I know my standpoint on this question has been generally adopted, although individual cases also exist which, corresponding to the view of Eppinger and Hess, show either vagotonus or sympaticotonus.

*(To be continued.)*

## MICHAEL SCOT: A THIRTEENTH-CENTURY SCIENTIST AND PHYSICIAN

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Edinburgh.

MICHAEL SCOT, the subject of our sketch, was born, according to Wood Brown<sup>1</sup> who has left the most comprehensive record of his elusive personality, somewhere on the Scottish Borders about the year 1175. His death is fixed by the same authority for the year 1232, and took place in the countryside of his birth, which also claims his grave. The period of Scot's life was perhaps the most prosperous that the South of Scotland has ever seen. The Angles of Northumbria had been driven out and peace had reigned in Lothian for 200 years. The Norsemen had been expelled from the Scottish Mainland. On the east coast, Berwick, reputed the chief port in Britain before the fourteenth century, was at the height of its prosperity; and in the West, Glasgow Cathedral, to-day the finest ecclesiastical building in Scotland, was then rising under Bishop Jocelyn's hand. The beautiful abbeys of Jedburgh, Kelso, Melrose, Dryburgh, Newbattle, and Holyrood had been founded as centres of light and learning by David I. half a century before. Here amid the pleasant vales and woods of Tweedside and Lothian peaceful Norman settlers had introduced art and learning without the strife from which England then suffered under Richard, John, and Henry III.

In these surroundings Michael Scot spent his boyhood's days, passing at a later period through the schools of Oxford, Paris, and Bologna. Both on the Scottish Borders and in Italy popular tradition holds strong memories of him, sometimes of a rational, sometimes of a supernatural kind; and he forms one of a group of pre-Renaissance scholars, all of whom were viewed by their age in a somewhat similar light. Scot was a youth of 18 when Albertus Magnus, the *doctor universalis* of the Schoolmen was born, and Roger Bacon, the *doctor admirabilis*, was a young student of 18 when Scot's life ended. At Paris he earned the name of "Michael the Mathematician"; and for the practical application of this science, then much in demand for architectural enterprises, he was distinguished later at the Court of Frederick II. He must also have studied theology,

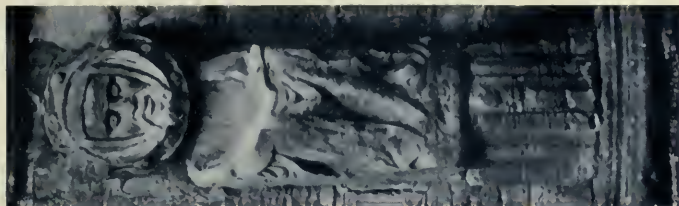




Portrait of Michael Scot from Bodleian MS., "De Physionomie" (14th cent.).



Fresco by Taddeo Gaddi in Spanish Chapel, Florence, "St Thomas Aquinas converting Unbelievers," showing Michael Scot, the central kneeling figure with skull-cap, in front row (ca. 1330).



Reputed effigy of Michael Scot in Melrose Abbey.



## Michael Scot: Scientist and Physician

for towards the close of his life in 1223 the Pope Honorius III. desired Stephen Langton, the Primate of England, to prefer Scot to a suitable vacancy, recommending him as distinguished among learned men for his remarkable gift of knowledge, and himself nominated Scot for the Archbishopric of Cashel in Ireland. This post, however, Scot declined because of his ignorance of the Irish vernacular.<sup>2</sup> Greek and Arabic were known to Scot, and his greatest life's work consisted in translations from these languages, which were doubtless learned by him at the period when he lived among the Moors and Greeks of Sicily.<sup>3</sup> With regard to his linguistic attainments, it is true that Roger Bacon speaks disparagingly:—"Though we have numerous translations," Bacon says, "of all the sciences, by Gerard of Cremona, Michael Scot, Alfred the Englishman, Hermann the German and William Fleming, there is such an utter falsity in all their writings that none can sufficiently wonder at it. For a translation to be true, it is necessary that a translator should know the language from which he is translating, the language into which he translates, and the science he wishes to translate. But who is he and I will praise him, for he has done marvellous things. Certainly none of the above named had any true knowledge of the tongues or the sciences, as is clear, not from their translations only, but their condition of life."<sup>4</sup> This wholesale depreciation is overdone and is the diatribe of a jealous man. It must have been bitter for Bacon, possessed of brilliant gifts and yet neglected by scholars, misunderstood by the laity, and condemned by the church to a life of obscurity and periods of long imprisonment, to see others no more learned, like Scot, dipping as they would into forbidden sciences, in high popular repute, and favoured by courts and prelates.

Between the years 1200 and 1208 Frederick, King of Sicily and later Emperor of Germany, a prince deservedly famous for his talents and for his encouragement of learning, lived at Palermo as a boy of 6 to 14 years, under the tutelage of the Canons of the Cathedral. Here Michael Scot acted as his tutor. In Palermo, therefore, at the half-Moorish court, Scot spent the opening years of the thirteenth century, and here he acted as Astronomer and Astrologer to the Emperor, composing for him two astrological books, the *Liber Introductorius* and *Liber Particularis*, which were of a popular or explanatory nature. In the Oxford MS. of the latter<sup>5</sup>

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from which I show an illuminated capital representing Scot himself, the colophon runs, "Here ends the book of Michael Scot, Astrologer to the Lord Frederick, Emperor of Rome, and ever august; which book he composed, in simple style, at the desire of the said Emperor. And this he did, not so much considering his own reputation as desiring to be serviceable and useful to young scholars, who of their great love for wisdom, desire to learn in the Quadrivium the Art of Astronomy."

A much more important book, judging it by its enormous vogue throughout the next four centuries, is the *Liber Physionomiæ*. At the age of 14 Frederick was married; and Scot dedicated this book as a guide in the knowledge of men, to the pupil about to pass from his charge into the stormy life of European politics. The work attained a great popularity in MS., and after the introduction of printing no less than eighteen editions appeared between 1477 and 1660. Part of the work is influenced by Aristotle's *History of Animals*; part is taken from the *Liber ad Mansorem* of Rhazes; but the greater portion is apparently from Scot's own observation. Of the three books into which it is divided, the first deals with the mysteries of generation and birth; the second expounds the signs of the different complexions, as revealed in various parts of the body or by dreams; and the third explains what signs of the inward character can be read in each of the bodily members. The specimen on opposite page will show its nature.

Scot's tutorship at an end with Frederick's marriage, he next set forth on a literary mission to Spain, where a regular school of translation existed at Toledo. Probably when Scot left Palermo he did so at the instigation of the Emperor Frederick and to him he dedicated the translations which he produced from the Arabic MSS. available in Spain. Two translations of Aristotle's Natural History of Animals, called respectively the *De Animalibus ad Caesarem* and the *Abbreviatio Avicennæ*, were the first-fruits of his labours. That he also set up a chemical laboratory in Toledo must appear from the fact that two books on Alchemy also issued from his pen, the *Liber Luminis*<sup>6</sup> and *De Alchimia*.<sup>7</sup> In the latter he gives a formula by which he states he had succeeded often in changing lead into the finest gold. Gold that is which would stand the tests then in common use. Another important astronomical work was



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his translation in 1217 of the *Sphere* of Alpetrongi, which as witnessed by Vincent of Beauvais and by Albertus Magnus

terforem superbum cito presumptuosus, inuidiōs, cupidus  
pulchrorum, z cito credentem. **ℒ** brachia sunt pingua et  
mufculofa fignificant homines, vana gloriā, cupidū quādam  
delectabile, z pl<sup>u</sup> inſipiere qđ ſapere in agetōe. **ℒ** brachia  
ſūt valde pilofa ſue ſunt macra ſue craſſa z mollia carnia,  
ſignificant hominē luxurioſum, tenere capacitatis, debi-  
lem, multę ſuſpitionis, z ſagaciter malicioſum. **ℒ** **ℒ** brachia  
ſunt valde nuda pilo / ſignificant hominē tenere ca-  
pacitatis, magne ire, cito redentem, paui laſſiuū, mēſore  
facile fallacē, facie in malo z debile.

**De manibus.**

La. lxxii.

Anus mollis carnis macra ⁊ longe significant bonum; minime boni intellectus tenere capacitas ⁊ facili timidum libenter pacificum ⁊ satis legalem ⁊ discretum seruilem ⁊ domesticū ⁊ euersatōis ⁊ doctrinalem. *Luius manus* sunt valde grosse ac breues ⁊ significant hominem grossū in finitū simpliciter ⁊ vānū ⁊ mendacem fortem laboriosū ⁊ fidelem citō credentem ⁊ breuius ire. *Luius manus* sunt pilose ⁊ grossorum pilorum ac digitorum ⁊ curuorum ⁊ significant hominem luxuriosū ⁊ vānū mendacem ⁊ grossū ingenuū ⁊ plus simpliciter q̃ sapientem. *Luius manus* in digitis curuantur sursum significant hominem liberalem ⁊ seruilem ⁊ capacitas bone sagacem parū inuidiōse ire ⁊ intellectus boni ⁊ mediocrem inter secretum ⁊ non lecretum. *Luius manus* sunt implicabiles ⁊ rebus extremā partem digitorum significant hominem tenacem ⁊ cupidū ⁊ taminiolū laboriosū sagacē duri ꝑpositi ⁊ nō citō credentibilem ac credendum austa-

**Il pectore.**

Ca. lxxviii.

**D**e pectore. Ca. lxxviii.  
 Equus grossum & amplum significat hominem for

Page from *Liber Physionomiæ* (early printed edition of 1497).

“Chapter 82, On the Hands.—Hands of soft flesh, slender and long, show a man of good intellect but little strength, easily frightened, gladly peaceful, pretty formal, discreetly obliging, of domestic habits and erudite. Hands that are very thick and short show a man of slow intelligence, simple, vain, lying, strong, hardworking, faithful, credulous, and good tempered. Hairy hands with strong hair and curved fingers show a man wanton, vain, lying, of slow intelligence, and more simple than wise. Hands with fingers curved backwards show a man liberal and obliging, of good strength, sagacious, little envious, wrathful, of good intellect, and moderately secretive. Hands with fingers stiff towards the ends show a man persistent, viciously acquisitive, hardworking, sagacious, of set purpose, not quickly persuaded to believe what he hears.”

influenced profoundly the astronomical beliefs of the time; and which probably was prepared for the Astronomical Congress assembled in 1218 by the King of Castile at Toledo.<sup>8</sup>

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Numerous minor writings and fragments are attributed also to Scot, e.g., *De Secretis Naturæ*,<sup>9</sup> on Geography, etc.

But the most renowned of all Scot's works was his translation from the Commentaries of Averroes of Cordova. Averroes (1126-98) was the great rationalist and arch-heretic of his time, banned alike from the paradise of Mohammedans and the heaven of the Christians; so that to translate and publish his works was a sin which probably lost for Scot any important ecclesiastical preferment, and which was one of the causes of embroilment between Frederick II. and the Papacy. Ten years after Scot's return from Toledo, Frederick decided to publish the translations of Averroes, which he had commissioned Scot and others to make, and this he did by sending copies to the various Universities. Roger Bacon speaks of Scot appearing with these translations in England in the year 1230, and of the impetus which they gave to the Aristotelian philosophy in the schools.<sup>10</sup> From this journey Scot appears never to have returned but to have died on a visit to his northern birthplace.

Scot's activities as a doctor naturally interest us particularly. Frederick returned in 1220, after a successful campaign against his rival Otho, to Palermo, where he was soon joined by Michael Scot fresh from his ten years of literary labour in Spain. The latter again took up the post of Court Astrologer in which he was busied casting horoscopes and forming predictions; and on these subjects he issued several minor works. He also became physician to Frederick. Sir Norman Moore describes the type of thirteenth-century physician in England as follows, a description which aptly fits Michael Scot: "It is clear," he says, "that considerable attainments were necessary before a man was styled medicus or physicus. His study chiefly consisted in reading books and hearing lectures on books in the University. Most learned men had read some medicine, or knew something about it; and some ecclesiastics had specially devoted themselves to a study the use of which was so suitable to their profession. Of this kind was the Abbot of Crokestone 'in arte medicina erudito,' who attended John in 1216 at Newark."<sup>11</sup>

Two influences which came into being early in the thirteenth century had a great effect in raising the knowledge and the status of the medical profession. The first of these was the establishment by Pope Innocent III. of the Holy Spirit Hospitals beginning in the year 1204. Virchow<sup>12</sup> has told the story of

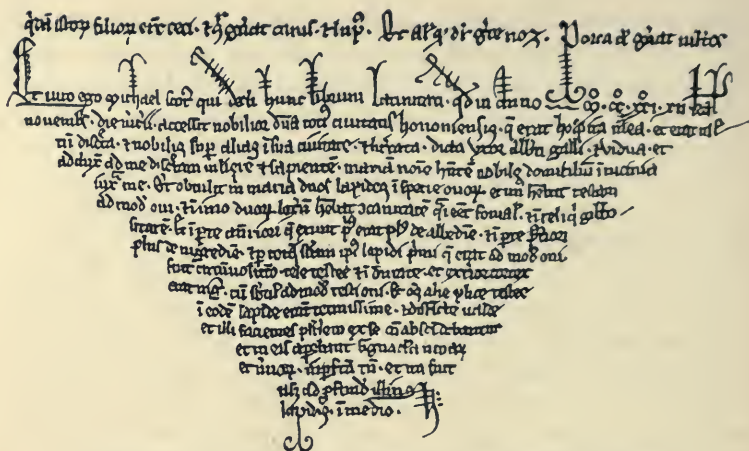
## Michael Scot: Scientist and Physician

these hospital foundations, and makes it clear that probably every town of 5000 inhabitants, everywhere throughout Europe, before the close of the thirteenth century had a hospital. Those in the larger towns at least, according to Walsh,<sup>13</sup> were model hospitals in many ways, and ever so much better than many hospital structures erected in post-medieval centuries. One of these thirteenth-century hospitals of the Holy Spirit is still standing at Lübeck in Germany. The other influence which had a profoundly steadying effect upon the medical profession, and with whose inception it is more than probable that Michael Scot was concerned, is found in the enactments of Frederick II. regarding the practice of medicine in Italy and Germany.<sup>14</sup> These enactments, which fixed the period of medical study at Salerno and Naples, instituted a State examination for the licence to practise, prescribed a scale of medical fees, and nominated inspectors for maintaining the quality of drugs, were issued in the year 1240. By this time Michael Scot had been dead eight years; but he is mentioned by de Renzi as one of the early teachers at the medical school of Salerno,<sup>15</sup> and on account of his intimacy with Frederick it is likely that he was consulted in any legislation likely to affect it. Since this formed the first attempt at a State organisation of medical studies, we shall be justified in feeling a measure of gratitude to old Michael Scot.

As a practising physician, Scot enjoyed a great reputation. Dempster, who was Professor at Bologna and Pisa from 1616 to 1625, speaks of Scot's "singular skill," calling him also "one of the first physicians for learning";<sup>16</sup> and another writer tells that he was noted for the cures he effected in difficult cases, and that he excelled in the treatment of leprosy, gout, and dropsy. A work on the urine by Michael Scot exists now in an Italian translation only; but in a later collection, recipes are quoted taken from "the book of Master Michael Scot, Physician to the Emperor Frederick, and other Doctors."<sup>17</sup> An interesting marginal note occurs on two early thirteenth century MSS. of Scot's *De Animalibus ad Caesarem*, recording apparently by his own hand a consultation at Bologna in the year 1221. One of these is preserved in the Library of Gonville and Caius College,<sup>18</sup> the other is the property of Amtmann Hof, Harford, North Germany, and appears from its abbreviations to be a copy.



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Facsimile of note in margin of 13th century MS. (slightly reduced).

The note runs as follows :—

"I, Michael Scot, who put this book into Latin, declare that in the year 1221, on the first of November, a very noble lady of the state of Bologna, who was my hostess, the widow of Albertus Gallus, discreet, noble above other ladies in her town and learned, brought to me a discreet and wise woman named Mary, dwelling in a fine house of the neighbourhood. Mary showed me two stones like eggs, one of which had a shell like an egg. On one side it was concave and elsewhere bulging. And on the front which came out first there was more whiteness—behind it was blacker. Through the whole substance of the first stone itself which was like an egg were layers of hardened shell and the outer layer was black, but yet light like eggshell. And all the other windings of shell in the same stone were very light, and very distinct, and they formed a powder when they were cut away, and among them appeared imperfect signs of veins and sinews. So it was, right to the middle of that stone. And the stone compared with its bulk was very light, and among all its pores appeared a passage of veins and sinews, and it was whiter on cutting into. And it was possible to cut the stone with a knife, and between the outer layer like an egg-shell and the inner pores was, as it were, a meal of powdered chalk, and that stone came from the womb of the said Mary on the first of July of the same year. And on the eighth day of July another stone of the same kind came out and of the same weight according to its bulk, for it was somewhat smaller, of darker colour and compressed on each side. And it seemed to the said Mary that for eight years before the passage of these stones the tumour was constantly lessening somewhat. And on the said stones were no furrows as in stones from the



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kidneys or bladder; and between the projections were signs of white skin, which you find to be due to its long duration. The said Mary consulted me on account of difficulty in urination."

It appears from this note that the stones were calcified fibroid tumours, and that Scot was familiar with the different appearance of stones from the bladder and kidneys. The consultation shows that he was recognised as a urinary specialist.

On a later folio of this Cambridge MS. is given a prescription similarly placed in the margin. Numbers of these prescriptions have been handed down associated with the name of Scot, notably certain "*Pilulæ Magistri Michaelis Scoti*,"<sup>19</sup> in a thirteenth-century MS. collection, which are commended by one scribe for all sicknesses in terms that suggest the advertisement of a modern patent medicine. Their main constituents are aloes, rhubarb, and nine fruits and flowers made into a confection. They might fairly be described as good after-dinner pills, but the thirteenth-century copyist recommends them to relieve headache, purge the humours wonderfully, produce joyfulness, brighten the intellect, improve the vision; sharpen hearing, preserve youth, and retard baldness.

A totally different aspect of Michael Scot is the reputation which he enjoyed, both during life and later, as a wizard. To the unlettered and unlearned of the thirteenth century, a man who had plunged deep into the knowledge of the mysterious East could not escape being regarded as a necromancer. The disapproval of the Church attaching to his translation of Averroes would tend to strengthen this idea; and the fama appears to have been further increased by Scot's deliberate actions. *Populus vult decipi*, and by many outstanding men, especially if they be inclined to politics, the wonder of the ignorant crowd is desired as much as the appreciation of the learned few. This fame, which lives to-day in Michael's own homeland of the Scottish Borders, is expressed by his illustrious namesake, Sir Walter Scott.\*<sup>20</sup>

Alas, however, for the fallibility of popular tradition, the camp at the base of the Eildon Hills was known to the Romans as *Trimontium*!

In Italy, Scot's reputation as a seer of the future and as a magician was so firmly established within the century follow-

\* Sir Walter Scott's attempt to identify the tutor of Frederick II. with Sir Michael Scot of Balwearie, cannot now be accepted, since the great

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ing his death that Dante places him in the *Inferno* with the Grecian soothsayers, Calchas and Eurypilus.<sup>21</sup>

“Quell’ altro, che ne’ fianchi è cosè poco,  
Michele Scotto fù, che veramente  
Delle magiche frode seppe il guioco.

That other, round the loins  
So slender of his shape, was Michael Scot,  
Practised in every slight of magic wile.”

*(Cary’s Translation.)*

One of Scot’s predictions was the death of his patron Frederick in a City of Flowers, believed by Frederick to be Florence which he therefore avoided, only to die at Fiorentino. Another was Scot’s own death from the blow of a stone on the head. To prevent this he constantly wore an iron cap, that proved useless in the end, because he was struck by a small piece of masonry from the roof of a church in which he was hearing the mass, bare-headed.

Boccaccio in the next century speaks of Scot’s magical or conjuring tricks during his stay at Bologna,<sup>22</sup> and a great number of such tales sprang up later round his name. Two of these later traditional tales give the impression that Scot relied for some of his effects upon hypnotic suggestion. At a feast held in January he caused vines with ripe clusters of grapes to appear on the table. The guests were bidden to choose each a bunch, and wait for a given word. At the word “cut” the grapes disappeared and the company found themselves each with a knife in one hand and his neighbour’s sleeve

Michael is known to have died some sixty years before Sir Michael went on his embassy to Norway in 1290.

“In these far climes it was my lot  
To meet the wondrous Michael Scott ;  
A Wizard of such dreaded fame,  
That when in Salamanca’s cave  
Him listed his magic wand to wave,  
The bells would ring in Notre Dame !  
Some of his skill he taught to me ;  
And, Warrior, I could say to thee  
The words that cleft Eildon Hills in three,  
And bridled the Tweed with a curb of stone :  
But to speak them were a deadly sin ;  
And for having but thought them my heart within,  
A treble penance must be done.”

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in the other. Another tale records how at a banquet given in Palermo by Frederick to celebrate his coronation in 1220 Scot and a companion suddenly appeared dressed in Eastern robes and offered to perform a wonder. The weather being hot Frederick asked for a cooling shower of rain, which the magicians produced with a sudden storm. So far the entertainment had probably been carefully prepared and stage-managed; and as a reward Scot asked that a German baron Ulfo should be allowed to accompany them upon an expedition. This being granted, it seemed to Ulfo that they set forth in galleys passed out into the Atlantic to a strange land, where followed battles, marriage with a lovely princess, twenty years of wedded bliss, and a large family of sons and daughters. Finally the magicians reappeared and persuaded him to accompany them back to Palermo, and on their return what was Ulfo's astonishment and grief to find the banquet of twenty years before no further advanced, and all his hardships and joys only a dream never to be repeated.<sup>23</sup>

As to Scot's personal appearance, Dante gives the impression of a spare man. There is a sculpture in Melrose Abbey which tradition reports to be the head of Michael Scot; and this shows thin cheeks, a sparse beard, and eager eyes. A similar appearance is shown by one of the figures in a picture on the wall of the Spanish Chapel in Florence. It represents a group of unbelievers receiving conversion from St Thomas Aquinas. In the front row two kneeling figures, one with a diadem and one wearing a metal head-piece represent probably the Emperor Frederick and Michael Scot; the hand of a figure which can be identified as Averroes points to the latter who also bears a strong resemblance to the Melrose effigy. The painting is attributed to Taddeo Gaddi,<sup>24</sup> a pupil of Giotto, and gives probably a faithful enough representation of Scot painted a century after his time. There are two other likenesses in illuminated MSS. of the *Liber Particularis* and *Liber Physionomiæ* dating from the early fourteenth century and preserved in the Bodleian Library.

I have referred to the manner of Scot's death as handed down by tradition. His grave is still shown in Melrose Abbey, but his resting place is also claimed by other places on the borders, such as Holme Coltram, Glenluce, and Burgh-under-Bowness. The *Book of Might* so dreaded in popular tradition may have been the Commentaries of Averroes, of which the



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publication had been delayed for twenty years to avoid injuring the susceptibility of the Church, and which Scot was bringing to the Western Schools when he died.

REFERENCES.—<sup>1</sup> *Life and Legend of Michael Scot*, Wood Brown, Edinburgh, 1897. <sup>2</sup> *Milman Church History*, iv., 17. <sup>3</sup> Wood Brown, *op. cit.*, p. 133. <sup>4</sup> *Compendium Studii*, cap. viii., Master of the Rolls Series. <sup>5</sup> Bodleian MS. Can. Misc. 555 Opera Astrolog. M. Scotti. <sup>6</sup> Riccardian Library, Florence, L. iii., 13, 119. See Wood Brown, *op. cit.*, p. 240. <sup>7</sup> Corpus Christi College MS., cxv., pp. 116-119. <sup>8</sup> See Wood Brown, *op. cit.*, p. 104. <sup>9</sup> Querfeld, *Michael Scottus und Seine Shrift de Secretis Naturæ*, Leipzig, 1919. <sup>10</sup> *Opus Majus*, Jebb's Ed., pp. 36, 37. <sup>11</sup> Moore, *Medicine in the British Isles*, 1908, p. 17. <sup>12</sup> Virchow, *Gesammelte Abhandlungen aus dem Gebiete der Oeffentlichen Medizin*, vol. ii., Berlin, 1877. <sup>13</sup> Walsh, *Medieval Medicine*, 1920, p. 172. <sup>14</sup> Huillard-Brehollis, *Diplomatic History of Frederick II.*, Paris, 1851. <sup>15</sup> De Renzi, *Collect Salern*, i., p. 292. <sup>16</sup> Dempster, *Historia Ecclesiastica*, xii., 495. <sup>17</sup> Wood Brown, *op. cit.*, p. 154. <sup>18</sup> *Catalogue of Gonville and Caius College*, 109 (i., 3). <sup>19</sup> Brit. Mus. Add. MSS. 24068 (22), fol. 97. <sup>20</sup> "Lay of the Last Minstrel," Canto II., Stanza 13. <sup>21</sup> Dante, *Inferno*, xx., 115-117. <sup>22</sup> Boccaccio, *Elinando*. <sup>23</sup> Wesselofsky, *Paradiso degli Alberti*, Bologna, 1867, ii., pp. 180-217. <sup>24</sup> Ruskin, *Mornings in Florence*, Nos. IV. and V.

The following is a list from Mrs Singer's Oxford Catalogue of Medical and Scientific MSS. in Britain, showing all the MSS. of Michael Scot preserved in this country :—

1. Oxford. All Souls College, LXXII. (vii.), 14th cent., *Avicenna*.
2. " Corpus Christi College, CXXV. (xxx.), 13th cent., *De Alkemia*.
3. " Bodleian Cann. Cod. Misc. 555, 14th cent., *De Physi-  
onomiæ and Liber Particularis* (Astronomy).
4. " *Ibid.*, 266, 15th cent., *Liber Introductorius* (Astronomy).
5. " *Ibid.*, 378, 15th cent., *Geography*.
6. " *Ibid.*, 562, 14th cent., *Abbreviatio Avicennæ*.
7. " Merton College, 278, 14th cent., *Aristotle de Animalibus*.
8. Cambridge. Gonville and Caius College, 109, 13th cent., *Aristotle  
de Animalibus*.
9. Cambridge University Library, Dd. iv., 30 I., 14th cent., *Aristotle  
de Animalibus*.
10. *Ibid.*, li. iii., 16, 13th cent., *Aristotle de Animalibus*.
11. British Museum, Add. 24068, 13th cent., *Prescriptions*.
12. British Museum, Royal, 7, C.I., 14th cent., *De Animalibus*.
13. *Ibid.*, 12, D. vi., 15th cent., *Astronomy*.
14. *Ibid.*, 12, C. xv., 13th cent., *De Animalibus*.
15. *Ibid.*, 12, F. xv., 13th cent., *De Animalibus*.
16. Durham Cathedral, C.I., 17 and 18, 14th cent., *Aristotle, with  
Commentary of Averroes*.
17. Edinburgh University, 132 (Laing Coll. 168), 15th cent., *Astrology*.



## CLINICAL RECORD

### CASE OF EXTENSIVE RESECTION OF THE SMALL INTESTINE.

By W. Q. WOOD.

CASE.—Mrs M., aged 62, was admitted to Ward 15 of the Royal Infirmary on the 26th of August 1915, with signs of strangulation of a large umbilical hernia. The hernia had been operated upon seven years previously, but had recurred four years later. Strangulation had been present for three days before admission. The patient had suffered for many years from chronic bronchitis, and a year before admission she had had a paralytic "shock," from which, however, she made a good recovery, except for some difficulty in speech. She was a weakly old woman, in great pain, and looking ill and worn-out. The pulse rate was 110; the heart sounds were closed but feeble. The hernia was tense and extremely tender, and its circumference was at least equal to that of a dinner-plate.

In view of the unsatisfactory general condition of the patient, it was decided to operate under local anæsthesia. A solution of  $\frac{1}{2}$  per cent. novocain with adrenalin was injected around the hernia in the line of the usual elliptical incision. The resulting anæsthesia was satisfactory in every respect. On opening the sac numerous black coils of small intestine presented, obviously gangrenous. The gangrenous portion was freed and brought outside, clamps were applied to the healthy bowel above and below, the mesentery secured, and the gangrenous bowel removed. On examination afterwards the portion of intestine resected was found to measure 7 feet 2 inches or 218 cm. The patient's condition being exceedingly grave, it was considered inadvisable to perform an immediate anastomosis, and accordingly a Paul's tube was tied in each end of the divided bowel, the intestine being secured to the margins of the wound. The wound was narrowed down so as to leave room only for the passage of the two loops of intestine. On the following day the patient was much better. The pulse rate came down to 104, and the tubes were draining freely. The further progress was satisfactory, the general condition remaining good in spite of the escape of intestinal contents at the wound.

On 6th September, again under local anæsthesia, the abdomen was opened in the mid-line below the umbilicus. It was possible then to ascertain the level at which the intestine had been resected. From the ileo-cæcal junction the ileum could be traced upwards for a

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distance of eight or ten inches, when it terminated at the umbilical wound, showing that the portion removed had consisted of the lower part of the ileum. To restore the continuity of the intestinal canal the intestine immediately above the proximal divided end was united to the cæcum by a lateral anastomosis, the distal portion of small intestine being too short to permit of a satisfactory junction above this level.

Thereafter the progress was satisfactory. The escape from the fistula gradually diminished, and a normal motion was passed by the rectum on 13th September. When the patient was discharged on 20th October, there was still some escape of faecal matter at the original wound. Her doctor, Dr Anderson of Armadale, reports that "after her return home the faecal fistula closed completely. The patient was wonderfully well and able to be up and about again." She died two years later from an attack of bronchitis with breakdown of compensation.'

COMMENT.—This case is of interest in view of the extent of the intestinal resection and of the special nature of the operative treatment. There are in the literature some forty-four cases of removal of a larger portion of the small intestine, the greatest being a removal of 540 cm. by Brenner, reported by Denk in 1910. The present case serves to support the belief that the surgeon need have no hesitation, from fear as to the effect on metabolism, in removing at least a third of the small intestine. The division of the operative treatment into two stages instead of performing immediate anastomosis was a risky procedure, since it was impossible to tell with certainty the level of the intestine removed. If the strangulation had involved the upper part of the small intestine instead of the lower, the patient must inevitably have died of starvation after the first stage. There seemed, however, to be no choice in this case. To have prolonged the operation further would have been to throw away any remaining chance that the patient had of recovery. The case serves also to illustrate the possibilities of local anaesthesia. The second operation involved a formal laparotomy, and yet, like the first, it was carried out without any great discomfort to the patient.

REFERENCE.—Denk, *Mitth. a. d. Grenzgeb. d. Med. u. Chir.*, 1910. Heft 1, p. 146.

## CRITICAL REVIEW

### CEREBRAL VENTRICULAR HÆMORRHAGES AT AND SOON AFTER BIRTH.

By J. W. BALLANTYNE, M.D., F.R.C.P.E.

THERE are many matters concerned with the pathology and morbid anatomy of the infant at and immediately after his birth about which further knowledge is greatly needed in order that a rational and helpful system of treatment may be securely established. Intra-cranial ventricular hæmorrhage is one of these insufficiently explored subjects. It is an obvious temptation to regard such an occurrence as due to the traumatism of labour or to infection taking place after the child's birth; but, as will be seen immediately when some actual cases are considered, neither of these explanations can always be invoked. The causation is much more complex than is sometimes suspected, and the pathogenesis much less clear than is supposed.

Drs Potocki and Levant,<sup>1</sup> for example, have reported three instances of nervous phenomena appearing in the new-born infant, in which the clinical symptoms and the post-mortem findings were with difficulty reconciled. In two of them the indications of intra-cranial lesions were late in appearing, and yet the lesions themselves were extensive, whilst in the third one nervous phenomena were early noticed, and yet the autopsy yielded curiously negative results. The cases call for a more intimate scrutiny.

In the first case the child was the product of a third pregnancy, and the infants resulting from the two former gestations were alive and well. Nothing abnormal was reported regarding the health of the parents. The pregnancy ended presumably (from the size and weight of the child) at or after the full time in a normal labour, and the infant on the evening of the fifth day began to suffer, wailing continuously but having no convulsions. It was brought into hospital on the following day, when it was found to be affected as follows:—There was conjugate deviation of the head and eyes to the right, right-sided facial paralysis (eye open, etc.), bulging of the anterior fontanelle, marked contracture of the upper limbs and less marked of the lower, convulsive attacks, and coma. Potocki diagnosed meningeal hæmorrhage of the left side with facial paralysis of central origin. Lumbar puncture revealed increased cerebro-spinal tension. Vomiting was continuous, the temperature fell, and the child died on the ninth day. At the autopsy most of the organs including the spinal cord showed no lesions, but the brain was markedly affected. The cranial



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sutures were wide and the bones separated from each other, accounting for the large diameters recorded. The cerebrum which was covered by congested membranes was softened in consistency, and the left lateral ventricle contained 100 grammes of serum, and a clot the size of a large egg.

The second case was similar. The parents were healthy; the child was the product of the second pregnancy, the first-born infant being alive and well. The labour was easy, but if the menstrual dates were correctly given it was a post-mature delivery. The infant, a female, weighed 2500 grammes. Three days after birth the child refused the breast, and on the following day she exhibited conjugate deviation of the head and eyes to the left, left-sided facial paralysis (Chvostek's symptom being well marked), rigidity of the neck, and exaggerated tendon reflexes in the lower limbs. Pinching of the skin provoked convulsive movements of the limbs. The child died on the next (fifth) day, notwithstanding the use of bromides and hot baths. The same diagnosis had been made as in the first case. Post-mortem examination again showed no abnormality outside the cranium. The fontanelles were bulging, and when the cranium was opened, a clot was discovered lying above the corpus callosum between the hemispheres and extending into the left lateral ventricle. Further dissection (after hardening) revealed a clot filling both lateral ventricles as well as the third and fourth, and extending through the aqueduct of Sylvius; the various parts of the brain were displaced and thinned out by the clot, but did not exhibit hæmorrhages into their substance. The spinal cord was not affected.

The chief difference between the two cases was in the amount of the hæmorrhage, the second infant having fully twice as much. In both the diagnosis was incorrect, for the meningeal hæmorrhage was slight and the ventricular extensive; and in both cases the authors were of opinion that the bleeding had not taken place before or during birth. The labours indeed were quite easy, although it was admitted that in the second the foetal head was in a posterior position. It would seem that the intraventricular bleeding began a few days after birth and rapidly ran a fatal course in both the infants, having in each practically the same symptomatology. This similarity was in one respect rather inexplicable, for in the second case the facial paralysis remained unilateral (as it did in the first) although the hæmorrhage was bilateral. In both cases the symptomatology gave no hint either of the nature or of the extent of the cerebral lesion.

With regard to causation it would almost seem as if there must be an undetected factor. It is stated, for instance, that the parental antecedents revealed nothing abnormal, and that the previous children were healthy; but there is no record of a Wassermann test being



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done, and without it absolute exclusion of syphilis is hardly possible. Then, again, in the first case, the cranial diameters in the infant were so large (O.F. = 13 cm., Bi-P. = 10.6 cm.) that traumatism during the passage of the head can hardly be regarded as impossible. In the second case the infant's weight (2500 grammes) suggests prematurity as a cause of the hæmorrhage; the menstrual dates indeed pointed rather to post-maturity, but probably all it is fair to conclude is that the date of conception was uncertain.

The observations, therefore, contain an inexplicable element both in respect of etiology and symptomatology; and a further difficulty is supplied by a third case reported by Potocki and Levant. The infant, in this instance, was full-term (weight 3200 grammes), and had ordinary cranial measurements (O.F. = 11.9 cm., Bi-P. = 8.9 cm.); but the mother's pelvis was contracted, the diagonal conjugate being just under 4 inches (9.9 cm.). The first confinement, however, had ended in the spontaneous birth of a full-time living child, and on the present occasion the delivery was again spontaneous, but the child was slightly asphyxiated and required resuscitation. There was considerable over-riding of the cranial bones. Fourteen hours after birth the infant took general convulsions of an athetotic type. On the second day there was facial paralysis of the left side, the head was turned to the left, and there was well-marked stiffness of the neck. The convulsions were more marked in the upper than in the lower limbs, and the fingers were twitching incessantly. Death occurred thirty-eight hours after birth. Having regard to the two former cases, and believing that the facial paralysis was central in origin, the authors diagnosed hæmorrhage into the right lateral cerebral ventricle, and performed the post-mortem examination, confidently expecting to find that lesion. No hæmorrhages, however, were found either in the brain or in the spinal cord, only congestion of the meninges. The thoracic and abdominal organs showed no abnormalities.

Here then were three cases with practically the same symptomatology and yet widely different pathological findings. In the first two infants there was nothing in the history of the labour to make large cerebral hæmorrhages likely and yet such were found, whilst in the third case the mother's pelvis was contracted and the child was born slightly asphyxiated, and yet no intra-cranial bleeding was discovered. The authors are frankly surprised and their astonishment will be shared by the reader. They pass in review all the probable causes of such cerebral hæmorrhages in the first two cases and exclude them all apparently, whilst in the third they find at least two apparently sufficient causes for bleeding and yet have to confess to the absence of recognisable lesions. One fact which may have some prognostic value remains, the time of the emergence of symptoms.

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The infants in the first two instances showed no signs of meningeal hæmorrhage for some days after birth, and yet had extensive intracranial lesions, whilst the third child exhibited alarming nervous symptoms and signs immediately after birth and nevertheless had no gross cerebral changes at all. If any reliance can be placed on the time element, therefore, it would seem that late development of symptoms points to a necessarily fatal issue, for one can hardly expect so extensive destruction of brain tissue to be recovered from, whilst the early emergence of the same symptoms may conceivably be less fatal. At the same time it has to be remembered that Potocki's third infant died also as well as the first two.

Obviously there is a need for further information regarding ventricular hæmorrhages in the new-born infant, and fortunately R. Beneke and F. Zausch have furnished some.<sup>2</sup> In one instance the child, a female, in addition to its small size (34 cm.), had all the signs of prematurity, and was stated to have been still-born, the small quantity of air found in the lungs being ascribed to attempts at resuscitation. Unfortunately no clinical details regarding the labour are given. There was a slight oedematous swelling over the occiput but no caput. The dura and pia mater over the cerebral convexity showed no abnormality, but the left lateral ventricle was distended with a large firm clot which could be traced through the inter-ventricular foramen (foramen of Monro) of that side into the third ventricle, completely filling it, and thence through the aqueductus cerebri (aqueduct of Sylvius) on to the floor of the fourth ventricle (fossa rhomboidea), and thence via the foramen of Magendie (median aperture of the fourth ventricle) to spread out under the cerebellum and on the pons and medulla oblongata. No lesion of the cerebral substance could be detected and the other organs were normal. Unfortunately the brain had not been preserved in such a way as to allow exact identification of the vessel which had given way and caused the bleeding, but the most probable conclusion was that it was either the vena magna of Galen (v. cerebri magna) or one of its large branches (venæ cerebri internæ). It was also impossible to decide whether the tentorium had been injured.

A case very similar to the above was reported by Dr Ludwig Seitz<sup>3</sup> in what must be regarded as a classical contribution to the whole subject of cerebral compression in the new-born following upon intracranial hæmorrhages and mechanical injuries to the brain. The mother of the affected infant was 40 years of age and a xv-para. Many of her earlier children had been born with some difficulty on account of their large size, and the present child weighed 2800 grams. The mother's pelvis, however, was large, and as a matter of fact the child was driven down from above the brim and into the world by

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one powerful uterine contraction. It was born in a state of asphyxia; there had been expulsion of meconium, and some mucus had been drawn into the trachea. Resuscitation was by means of skin-stimulation, hot and cold baths, and aspiration of mucus; but the child (a male) was also twice swung by Schultze's manœuvre. During the first day of life his breathing was unsatisfactory and he would not take the breast. On the next day he took the breast but continued to be restless and cried much in a weak way. He had been placed in the incubator at birth. On the third day the breathing was not satisfactory (signs of atelectasis), and there were clonic contractions from time to time, affecting especially the upper limbs and the eyelid muscles. The pupils were contracted. The pulse was not slower than usual. Soon afterwards the breathing became difficult and there were signs of paralysis of the respiratory centre, and death occurred. The treatment consisted in the use of warm baths, cold compresses, and the incubator; and the diagnosis of intra-crâniâle hæmorrhage had been provisionally made. The autopsy revealed a condition almost identical with that found in the infants reported upon by Beneke and Zausch and Potocki and Levant. There were no hæmorrhages in the membranes on the upper aspect of the brain; but the two lateral ventricles were distended with blood-clot which could be traced through the third into the fourth ventricle and thence into the intermeningeal space round the medulla and spinal cord. Save that the lungs were atelectatic the other organs of the body were normal. The hæmorrhage in the lateral ventricles was ascribed to the state of asphyxia existing at birth, and the condition to tearing of the sinus rectus during the strong uterine contraction which expelled the child through the cervico-vaginal canal.

Seitz grouped all cases of intra-cranial hæmorrhage in the new-born into three divisions: (1) supra-tentorial, in which the bleeding occurred over the cerebrum from injury to the longitudinal sinus or the vessels emptying into it; (2) infra-tentorial, in which the bleeding was due to injuries of the transverse sinus or tributary vessels and occurred around the cerebellum; and (3) mixed forms. He placed intra-ventricular hæmorrhages in the second group, the bleeding taking place from the choroid plexus. He gave considerable weight to tearing of the tentorium in these cases; but it was absent in the infant whose history has been referred to above.

In another case reported by Beneke and Zausch<sup>2</sup> there was also intra-ventricular hæmorrhage without laceration of the tentorium. The labour was complicated by partial placenta prævia necessitating version, and the head of the child had to be helped into the world by the Smellie-Veit grip. The child died when twelve days old, and in the later part of its short life it exhibited cerebral symptoms (paralysis, etc.).



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The ventricles were found to be filled with clot, and there was also a space in the left temporal lobe similarly occupied. The ependyma was thickened. The important change in this case, however, was discovered in softening of the brain substance, and this was ascribed to injury received at birth. The hæmorrhage was regarded as secondary and as occurring near the close of life, in the injured and degenerated brain.

In yet another case which Beneke and Zausch place as an appendix to their article there was ventricular hæmorrhage. The subject was a premature (seven months') infant whose mother died from the effects of accidental drinking of poison. The child lived for thirty-six hours, and, save for its jaundiced state, seemed to be normal. The autopsy showed blood-clot under the pia mater over the cerebellum and posterior part of the cerebrum: there was also clot filling the lateral and the third and fourth ventricles. The cause of the bleeding was the rupture either of the vena magna of Galen or of one of the internal cerebral veins, and the occasion was probably the passage of the head through the birth-canals. There was no asphyxia in this instance.

In the eighteen cases of cerebral hæmorrhage of the new-born reported by Dr Margaret Warwick<sup>4</sup> there were two in which the hæmorrhage affected the ventricles only and one in which the bleeding into the ventricles was associated with effusion of blood over the cerebrum and cerebellum. Dr Warwick's series of cases brought out some interesting facts, *e.g.*, the frequency of prematurity (one fourth), the rarity of the use of forceps (one instance only and that an easy labour), and the absence of evidence of syphilis in any case. In 44 per cent. of her cases she found an etiological explanation in hæmorrhagic disease of the new-born. Unfortunately, from the point of view of the present critical summary, the intra-ventricular cases were not described separately from the others.

In A. C. Eastman's case of intra-ventricular hæmorrhage<sup>5</sup> the etiology seems clear enough. The mother was a i-para with a moderately contracted pelvis at the full term of a normal pregnancy. The head descended into the pelvic cavity; but forceps application was necessary, and, as ordinary traction was insufficient, the writer had to have recourse to "forcible forceps delivery." At birth the child made only spasmodic respiratory efforts and had to be resuscitated by mouth-to-mouth insufflation. It weighed 7 lbs. 2 oz., and the pressure marks on the head were not very marked. Soon after birth it was noticed that a tremor or spasm of the lower jaw accompanied each cry; on the second day there was twitching of the hands and arms; and on the third, tonic flexion of the thigh with rigidity of the elbow was noticed. The child rejected the breast milk and its weight



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fell below 6 lbs. The anterior fontanelle was flat and soft, and the eyes were normal. At this time the diagnosis of a small cerebral hæmorrhage was made. On the sixth day slight tenseness of the fontanelle was observed; on the ninth it was decidedly distended and the whole head began to have the appearance of moderate hydrocephalus. There was a gradual increase in the severity of the symptoms till the fourteenth day when death occurred, general convulsions taking place just before the fatal issue. Lumbar puncture allowed dark blood to escape. When the head was opened a considerable quantity of fluid blood was found between the dura and the pia mater; both lateral ventricles were filled with moderate-sized blood-clots. The surface of the brain was free from clots but the veins were distended.

It may be interesting to add to this summary of comparatively recent cases a note of one reported in 1895 by Sir William Osler. It was published in the *Quarterly Journal of Antenatal Pathology* which the maker of this review was then editing.<sup>6</sup> The mother died from typhoid fever before the birth of her child could take place. She also suffered from syphilis, exhibiting the Hutchinsonian triad of physical signs. The foetus when removed from the uterus had the appearances of the sixth month; inside the brain there was a hæmorrhage in the left hemisphere occupying a large part of the centrum ovale and extending into the left lateral ventricle. This observation proves clearly that these ventricular hæmorrhages may occur *in utero* and be quite independent of birth-traumatism.

It is obvious from a study of such cases as have been recorded that cerebral ventricular hæmorrhage is a not unknown cause of still-birth and of early neonatal death. It is equally clear that the morbid state gives rise to a group of symptoms which vary much and are difficult to classify and explain; and it is obvious that the etiology of the lesion is obscure and its pathogenesis complicated. The symptoms vary much after birth but always contain a number which point to cerebral compression. In many of the reported cases symptoms apart from the nervous system were wanting. The localisation of the lesion, however, was not made with security in any case; and in one of Potocki and Levant's patients the apparently localising symptoms were accompanied by no hæmorrhagic lesion. Closer study of these cases and more exact comparison of symptoms and signs during life with the findings after death will doubtless tend to explain many anomalies which at present puzzle the observer. Perhaps one ought especially to remember that hæmorrhage in the ventricular system of the brain may through the extent of that system cause pressure upon very different parts of the brain (basal ganglia, respiratory centre, etc.)

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The cases which have been narrated suggest a multiplicity of causal factors in the production of ventricular hæmorrhage; they certainly do not point to any one or even to any two outstanding causes. In turn one thinks of and then very often passes away from the traumatism of labour or of forceps application, of prematurity or of post-maturity of birth, of syphilis or of the so-called "hæmorrhagic disease of the new-born," of infection at birth, or of fevers in the mother, and of too rapid expulsion of the child or of too slow birth. In some instances, asphyxia seems to play a part, and in others it can be quite excluded. In a series of routine post-mortems upon fœtuses and new-born infants in connection with the Edinburgh Royal Maternity Hospital, Dr F. J. Browne has told the writer that he was struck by the frequency with which prematurity and syphilis could be invoked and by the rarity with which there was any history of marked obstetric traumatism. So far as pathogenesis can be cleared up the most probable steps in the process seem to be fragility of the vessel walls and increased pressure within the vessels, and the veins to give way seem to have been the choroid, the internal cerebral, and the great vein of Galen. In attempting to settle these many moot points the observer of the future will be greatly aided by the routine post-mortem examination of all still-births and of all cases of neonatal death; the sectioning only of cases in which there were signs of cerebral hæmorrhage is not sufficient. Osler's case of cerebral ventricular hæmorrhage in a fœtus which never passed through the birth-canals has obviously an important bearing upon pathogenesis.

Whilst some attempts, notably by Cushing,<sup>7</sup> Scott Carmichael,<sup>8</sup> and Wilcox,<sup>9</sup> have been made to encourage surgeons to attempt, by trephining or by the less forcible raising of the cranial vault bones at the sutures, to remove the cause of compression in cerebral hæmorrhages in the new-born, it must be admitted that the *ventricular* hæmorrhages hardly offer a hopeful sphere for such intervention, however much one may be led to look for good results in the case of clots on the surface of the cerebrum. It is rather in the direction of prevention that the record of these cases of intra-cranial bleeding in and immediately after birth will stimulate progress. If, as seems to be the case, a great number of causes may be active in producing such hæmorrhages, and if, as is undoubtedly the case, the hæmorrhages have such dire effects upon the lives of the children, it behoves the obstetrician carefully to revise his practice and more especially to remember that prematurely born infants and the children of unhealthy mothers require a much more tender handling than has hitherto been regarded as sufficient.

LITERATURE.—<sup>1</sup> Potocki and Levant, "Hémorrhagies ventriculaires à apparition tardive chez le nouveau-né," *Ann. de gynéc. et d'obstét.*, 2 ser.,

## Cerebral Ventricular Hæmorrhages

xiii., p. 714, 1919. <sup>2</sup> Beneke, R., and Zausch, F., "Zwei Fälle von Hirnläsion bei Neugeborenen durch Geburtstrauma," *Zentralbl. für Gynäk.*, 1920, xlv., p. 34. <sup>3</sup> Seitz, L., "Hirndrucksymptome bei Neugeborenen in Folge intracranieller Blutungen," *Arch. für Gynäk.*, 1907, lxxxii., p. 528. <sup>4</sup> Warwick, M., "Cerebral Hæmorrhage of the New-born," *Amer. Journ. Med. Science*, 1919, clviii., p. 95. <sup>5</sup> Eastman, A. C., "Intraventricular Hæmorrhage of the New-born," *Boston Med. and Surg. Journ.*, 1913, clxviii., p. 165. <sup>6</sup> Osler, W., "Case of Cerebral Hæmorrhage in a Fœtus," *Teratologia*, 1895, ii., p. 13. <sup>7</sup> Cushing, "Intracranial Hæmorrhage of the New-born," *Amer. Journ. Med. Science*, 1905, cxxx., p. 563. <sup>8</sup> Carmichael, E. S., "A Plea for Operative Interference in Intracranial Hæmorrhages in the New-born," *Trans. Edin. Obstet. Soc.*, 1906, xxxi., p. 105. <sup>9</sup> Wilcox, D. G., "Head Injuries in the New-born," *Boston Med. and Surg. Journ.*, 1913, clxviii., p. 568.

## NEW BOOK

*Leçons de Pathologie digestive.* Par M. LOEPER, professeur agrégé à la Faculté de Médecine de Paris, etc. 4<sup>e</sup> Série. Pp. vii + 298, with 34 illustrations. Paris: Masson et C<sup>ie</sup>. 1919. Price 11 fr. net.

The present volume comprises a fourth series of studies in the pathology of the digestive system, and consists of a somewhat heterogeneous collection of articles which reflect the new aspects that many alimentary disorders have assumed under war conditions.

A prominent place has been given to Intoxications of the Digestive Tract, including those caused by gas and by bacillary dysentery; whilst the varied types of indigestion which the war has brought into prominence are suggestively passed in review. There are helpful chapters on dyspepsias due to shock, concussion, and inadequacy of the endocrine glands, on gastric and duodenal ulceration, and on pain and neoplasms in the stomach and bowel. In addition to these, the "Leçons" deal with numerous other points of current interest, all of which bear the marks of personal observation and study; so that, although the book contains nothing strikingly novel, it is well worth reading on account of the fresh manner in which the subjects are presented and the thoroughly practical conclusions which are reached by the author.

## BOOKS RECEIVED

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|---|----------|
| AUSTIN, E. E. <i>The House-Fly: Its Life-History and Practical Measures for its Suppression</i><br>(Sold at British Museum, B. Quaritch Ltd., and Dulau & Co. Ltd.) | 1s. 6d.  |
| BURTON-OPITZ, RUSSELL. <i>A Textbook of Physiology</i><br>(W. B. Saunders Co., Ltd.)  | 32s. 6d. |
| CHATTERJI, K. K. <i>Syphilis: with special reference to the Tropics</i><br>(Butterworth & Co. (India) Ltd.)   | Rs. 15   |
| CRILE, GEO. W., and WILLIAM E. LOWER. <i>Surgical Shock and the Shockless Operation.</i> Second Edition. (W. B. Saunders Co., Ltd.)                                 | 21s.     |
| DONALD, ARCHIBALD. <i>An Introduction to Midwifery.</i> Eighth edition<br>(Charles Griffin & Co., Ltd.)   | 6s.      |
| HART, A. HERBERT. <i>The Doctor's Manual.</i> Fourth Edition<br>(John Bale, Sons & Danielsson, Ltd.)  | 10s. 6d. |
| HOWDEN, ROBERT. <i>Gray's Anatomy.</i> Twenty-first Edition<br>(Longmans, Green & Co.)  | 42s.     |
| LANG, WILLIAM DICKSON. <i>A Handbook of British Mosquitoes</i><br>(Sold by Longmans, Green & Co., B. Quaritch Ltd., and Dulau & Co., Ltd.)                          | 20s.     |
| MEDICAL ANNUAL, 1920 . . . . . (John Wright & Sons, Ltd.)   | 15s.     |
| NORRIS, GEORGE WILLIAM, and HENRY R. M. LANDIS. <i>Diseases of the Chest.</i> Second Edition . . . . . (W. B. Saunders Co., Ltd.)                                   | 35s.     |
| SYME, W. S. <i>Handbook of Diseases of the Nose, Throat, and Ear</i><br>(E. & S. Livingstone)   | 9s.      |
| THE INDUSTRIAL CLINIC. <i>By Several Writers</i><br>(John Bale, Sons & Danielsson, Ltd.)  | 10s. 6d. |
| WESTLAND, ALBERT. <i>The Wife and Mother.</i> Seventh Edition<br>(Charles Griffin & Co., Ltd.)  | 5s.      |



# Edinburgh Medical Journal

August 1920

## EDITORIAL NOTES

At the Graduation Ceremonial held on 8th July, the Vice-Chancellor conferred Degrees on the following:—*The University of Edinburgh, Graduation Ceremonial.* Honorary Degree of Doctor of Laws.—The Right Hon. George Nicoll Barnes, M.P.; Emeritus Professor Francis M. Caird; Sir Richard Tetley Glazebrook, K.C.B., F.R.S., Cambridge; Sir P. J. Hamilton-Grierson, Edinburgh; General Baron Horne, of Stirkoke, G.C.B., K.C.M.G.; John Horne, F.R.S., LL.D., Edinburgh; Mrs George Kerr, Edinburgh; Rudyard Kipling; Professor Arthur Anthony Macdonell, Oxford; Miss S. E. S. Mair, Edinburgh; Vice-Admiral Sir Henry Francis Oliver, K.C.M.G.; Emeritus Professor A. S. Pringle-Pattison; Emeritus Professor William Russell; Emeritus Professor George Saintsbury; Sir Napier Shaw, F.R.S.; Professor George Neil Stewart, Cleveland, U.S.A.

*The Degree of Doctor of Medicine.*—George J. Adams; Peter Allan; David C. Barron (*Commended for Thesis*); Lawrence D. Callander; Sydney T. Champtaloup (*Gold Medal*); Duncan Cook; Thomas F. Corkill (*Very Highly Commended for Thesis*); James W. Edington (*Commended for Thesis*); Harry Evans; George William Marshall Findlay (*Gold Medal*); Andrew W. Forrest; Henry J. C. Gibson; James Gossip; Thomas P. Herriot; William N. W. Kennedy; James Lawson; William A. Lethem; David Murray Lyon (*Gold Medal*); William F. M'Lean; Francis G. Macnaughton (*Commended*); Duncan J. M'Rae; James R. Menzies; George Nicholson; Edwin Douglas Pullon (*Gold Medal*); Atholl Robertson; James A. Thompson; Claude B. Tudehope, William G. Wyllie (*Commended*).

*The Degree of Doctor of Science in the Department of Public Health.*—Sydney T. Champtaloup, B.Sc., M.D.

*The Degrees of Bachelor of Medicine and Bachelor of Surgery.*—Harry S. Alexander; Reginald L. Baikie; Philip Barlow; George S. Barnett; Richard E. Batson; Christiaan F. Beyers; Sam Borochowitz; F. G. Harman Brown; Kenneth S. Brown; Henry W. Burne; Ronald M'D. Cairns; Grace S. Calver; Aidan Campbell; Helen Campbell (*Second Class Honours*); Harry Cohen; Dorothy Court; John R. Crolus; Montague Danziger; James Davidson; James H. Dick; Margaret L. Dobbie; Herbert J. C. Durward; Basil A. G. A. Edelston; Joseph H. Fairweather (*Second Class Honours*); Owen Fitzpatrick;

## Editorial Notes

Elizabeth S. Forbes; Dora W. Gerrard; Geoffrey M. Gibbon; Mary L. Gilchrist; James A. Gillison; Michael S. Goldberg; Jessie Gordon; Janet Grant (*First Class Honours*); Arthur W. P. Haine; John E. Haine (*Second Class Honours*); Arthur J. C. Hamilton (*Second Class Honours*); S. W. Hardikar; Christina M. Hawick; John P. Hope; Jacobus P. Immelman; William Isbister; William Kantor; Eleanor H. Kelly; Douglas J. A. Kerr; Ba Kin; Sydney Levey; James A. L. Loudon; Douglas I. O. Macaulay; James F. M'Conchie; Margaret M. M'Dowell; Alexander G. MacGillivray; Agnes M. Macgown (*Second Class Honours*); Agnes R. Macgregor (*Second Class Honours*); Henry M'Kay; Florence E. M'Kenzie; Jean R. Maclean; John M'Leman; Jane MacLennan; Annie S. MacLeod (*Second Class Honours*); Jean S. B. M'Neil; Philippus B. Malherbe; Victor G. Massie; Robert M'K. van der Merwe; Christian B. F. Millar (*Second Class Honours*); Christine G. Mitcheson; Donald J. Morrison; Emily M. Mure; Andrew R. Murray; David J. T. Oswald; Anand S. Paranjpe; William P. Petrie; Kenneth M. Purves (*First Class Honours*); Johannes C. Rabie; Charles B. Reekie; Ruth J. D. Ritchie; Hera Ross; Annie M. Roxburgh; Charles W. Rubidge; Louie A. Rubidge; Helen M. Russell; Henry J. E. Schultz; Thomas Scott; Charles Shapiro; George A. Sinclair; William A. Sinclair; Philip B. Smale; Alice B. S. Smith; Dorothy M. Smith; Thomas Sprunt (*Second Class Honours*); Ian M. Thompson; Henry Thomson; Mabel Thomson; Marjorie Thomson; David L. M. Tod; John C. Truter; Thomas C. Wakefield; Grace Walker; Edith G. Wilkes; Apolina A. Wilson; James M. Young (*Second Class Honours*).

*The Degree of Bachelor of Science, in the Department of Public Health.*—Thomas Campion Lauder, M.B. (Lt.-Col., R.A.M.C.) *The Diploma in Public Health.*—George A. Borthwick, M.B.; George Campbell, M.B.; John Dick, M.B.; George F. P. Heathcote, M.B.; Wilhelmina W. Hendry, M.B.; Mary P. Hislop, M.B.; Alexander J. Pollock, M.B.; Francis B. Sutherland, M.B.; James M. Tyrrell, M.B. The following awards were made:—*Thesis Gold Medals* to George William Marshall Findlay, M.D.; David Murray Lyon, M.D.; Edwin Douglas Pullon, M.D. *The Cameron Prize in Practical Therapeutics* to Sir Robert Jones, K.B.E., C.B., F.R.C.S.(Eng. and Edin.). *The Ellis Prize in Physiology* to Robert J. S. M'Dowall, M.B., Ch.B. *The Gunning Victoria Jubilee Prize in Materia Medica* to Francis George Macnaughton, M.D. *The Ettles Scholarship and Leslie Gold Medal* to Andrew Weir Davison, M.B., Ch.B. *The Allan Fellowship in Clinical Medicine and Clinical Surgery* to Agnes Rose Macgregor, M.B., Ch.B. *The Freeland Barbour Fellowship* to Helen Campbell, M.B., Ch.B. *The M'Cosh Graduate's and Medical Bursaries* to David Livingstone M'Rae Tod, M.A., B.Sc., M.B., Ch.B. *The Beaney Prize*

## Editorial Notes

*in Anatomy and Surgery* to Arthur James Cochrane Hamilton, M.B., Ch.B. *The Mouat Scholarship in the Practice of Physic* to Henry Wallace Burne, M.B., Ch.B. *The Conan Doyle Prize* to Sydney Levey, M.B., Ch.B. *The Annandale Gold Medal in Clinical Surgery* to Arthur James Cochrane Hamilton, M.B., Ch.B. *The Buchanan Scholarship in Gynecology* to Janet Grant, M.B., Ch.B. *The James Scott Scholarship in Midwifery* to Douglas Alexander Miller, M.B., Ch.B. *The Scottish Association for Medical Education of Women Prize* to Janet Grant, M.B., Ch.B. *The Dorothy Gilfillan Memorial Prize* to Janet Grant, M.B., Ch.B. *The Wellcome Medals in the History of Medicine*.—*Gold Medal* to Adam Cairns White; *Silver Medal* to Hilda Marion Davis. *The Pattison Prize in Clinical Surgery* to John Murray Black. *The Wightman Prize in Clinical Medicine* to Thomas Ferguson. *The Cunningham Memorial Medal and Prize in Anatomy* to John Gray. *The Whiteside Bruce Bursary* to Rennie Cooksey Burton and Margaret Christine Tod, Equal.

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At the recent Dental Examinations the following candidates passed the  
**Royal College of Surgeons of Edinburgh.** Final Examination and were granted the Diploma L.D.S., R.C.S.Edin.:—Margaret Peterkin, Fraserburgh; Alexander Glen Thom, Edinburgh; Ernest Purves Thomson, Edinburgh; Thomas Archibald Hall, Edinburgh; Johannes Vlok Basson, South Africa; John Lawson Gibson, Edinburgh; Willem Frederik Pauw, South Africa.

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A QUARTERLY Meeting of the Royal College of Physicians was held  
**Royal College of Physicians of Edinburgh.** on the 4th May, Sir Robert Philip (President) in the Chair.  
Dr Andrew Graham Ritchie was elected a Fellow of the College; Dr George Sandison Brock, M.B.E., Dr Chung Yik Wang, and Dr Thomas Frederick Corkill were elected Members of the College; the Lister Fellowship for Original Research was awarded to Dr G. W. Marshall Findlay.

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At the last Examination of the Board of the Royal College of  
**Diploma in Public Health.** Physicians of Edinburgh, Royal College of Surgeons of Edinburgh, the Royal Faculty of Physicians and Surgeons of Glasgow, the following candidates having passed the First and Second Examinations, were admitted Diplomates in Public Health:—Dr Maurice Exell Willcock, Lerwick; Dr Stanley Honeyman, Cupar-Fife; Dr George King, Edinburgh; Dr Ian Campbell Mackay, Aberfeldy; Dr Ralph Johnston Tait, Edinburgh; Dr Margaret Allison Alexander, Perth; Dr Thomas Macmillan Anderson, Jedburgh; Dr Philip Clermont Livingston, Fleet Aircraft Depot, Donibristle; Dr James Whitson Kemp Bruce, Edinburgh; Dr Herbert Frederick Wilfrid Adams, Edinburgh; Dr Edward Dow Fisher, Edinburgh; Dr Jessie Alexander MacLaren, Edinburgh; Dr Thomas Pearson Herriot, Berwick-on-Tweed; Dr Alexander Bremner, Sheffield; Dr Andrew Gray Carment, Lundin Links.



# FUNCTIONAL MENTAL ILLNESSES.

THE MORISON LECTURES, 1920.

By R. G. ROWS.

## I.

I MUST first apologise for having failed to fulfil my engagement to deliver the Morison Lectures a year ago, but four years' continuous work in the Hospital at Maghull had left me without sufficient energy to accomplish the task. I feel personally indebted to Dr Ninian Bruce for stepping into the breach. I appreciate most highly the sympathy extended to me at the time and also the honour conferred on me by the Royal College of Physicians of Edinburgh in inviting me to give the lectures in 1920.

The subject which I have chosen for the lectures is that of Functional Mental Illnesses. This subject, surrounded by much that is mysterious, at times attributed to the visitation of the wrath of the gods for sins committed, at others considered to be the product of the activity of demons, is, we may hope, on the way to receive more scientific investigation on new lines which promise to enlighten us as to the pathogenesis and treatment of mental illnesses. The experience gained during the years of the war has focussed public attention on these disabilities, has forced on us the necessity of considering them from a broader point of view, and has demonstrated that the dire results usually associated with disturbances of the mind may be to a large extent avoided by adequate treatment provided during the early stages of the illness.

The ideas generally associated with the term "mental illness" have a legal rather than a medical significance. "Insanity" and "segregation in an asylum" are legal terms, and it is these which immediately spring into the mind when the subject is mentioned, unaccompanied, as a rule, by any medical term or idea of medical treatment.

Until recent years, investigations into mental illnesses to a large extent took the form of compiling symptoms, and classifying patients according to these symptoms and according to the course run by the illness during a series of years. But, as Professor J. A. Thomson says in his work on *Heredity*,



## Functional Mental Illnesses

"a collection without labels is a contradiction in terms, and yet the label is often a full-stop to investigation." And so our progress in this subject has perhaps been hindered by the careful classification which so many have laboured to evolve, with the result that an unfortunate case has been thrust into a water-tight compartment and has remained there, although he would have fitted one or two other compartments just as satisfactorily. This was evident when the Munich School invented the class "*Dementia Præcox*," and emptied a large number of the manic-depressives into it, only to reinstate them in the manic-depressive compartment a year or two later.

A collection of symptoms is necessary from the clinical point of view, but it must be to a large extent sterile from the points of view of understanding the ætiology of the condition, and the mechanisms on which the disturbance depends. Such compilations have been made for the last two thousand years or more, and the old observers who studied the mysteries of the mind and its aberrations have given us clinical descriptions which are most interesting. Hippocrates and Aristotle made observations on alcoholic delirium and the varying reactions seen in conditions of intoxication produced by *quis-quina*, the mandrake, hellebore, and other drugs. *Melancholia*, explained on a humoral theory, with its somatic and psychic results, was described as a psychosis characterised by prolonged psychic pain and morbid dread. *Aræteus* enumerated as symptoms of this disorder sadness, anxiety, apathy or restlessness, misanthropism, phobias, delusions connected with religion and wickedness, disgust with life and tendency to suicide, insomnia, and constipation. *Mania* he outlined less completely, but he did recognise that some maniacs were gay, some just happy, mischievous, irritable, or violent. He suggested that mania often began as *melancholia*, and he alluded to the extreme frequency of an initial depression. *Celsus*, besides these types, described insanities with hallucinations, some of which lasted a short time and proceeded to recovery, while in others the disease persisted during the life of the patient. *Catatonia* and *hypochondria* were recognised by Hippocrates, and other writers described *hysteria* and referred to the criminality of epileptics.

The ancients had also their therapy for these conditions. Their psychotherapy took the form of persuasive suggestion,

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mental exercises, manual work, distraction, travel, music. They spoke of a disposition to mental disorders and recognised the importance of heredity as a cause. These observers lacked, of course, a basis of detailed knowledge of anatomy and physiology, but they localised the psychic processes in the brain: the brain was to them the organ of mind, and it was assumed that the mental disturbances must also be localised in that organ.

Much of this knowledge was lost for a long period, during which the church supplanted the doctor, and the excellent work of the early investigators was not continued. At the beginning of the last century the pitiable state of the sufferers attracted the attention of the public and of the medical profession, and the study of these illnesses was again undertaken. But this study was largely conducted along the old lines, and only recently has it advanced beyond the collection of symptoms and their classification into categories. In the last few years, however, our knowledge of the anatomy and physiology of the nervous system has advanced enormously; the principles of pathology are being discovered; work in the spheres of psychology, comparative psychology, and the study of the child-mind are providing valuable information.

Another line of investigation which has broadened our view of these conditions is that suggested by Freud. Led by analysing a series of cases of neuroses to see that the symptoms were determined by influences which had acted on the patient in some previous period of his life, he came to regard the symptoms as points of departure for investigation rather than important entities in themselves to be collected and catalogued. Previous investigation as to ætiology had frequently been limited too much to inquiring into family history, the incidence of illness, syphilis, tubercle, and cancer; of exhaustion, alcohol, anxiety, or accident. Causes such as these may participate in bringing about a mental illness and frequently are the exciting factors, but it is difficult to understand how they alone can determine either the onset or the form in which the malady shall occur. Freud has, however, provided us with methods of investigation, which in a large number of functional mental disturbances give an insight not only of the factors concerned but also of some of the mechanisms through which such results are developed. The hypotheses evolved to explain these mechanisms may not be accepted in their entirety and

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they may be modified to some extent after further research, but the recognition of the influence exerted by past experiences, even perhaps those of the earliest childhood, in the determination of an existing illness, cannot fail to illumine much of the darkness in which our subject is shrouded. At the same time we must remember that the brain is only one of the organs of the body, and, as it may influence the functions of the other organs, so in turn its own normal activity will depend to a large extent on the variety of stimuli which it may receive from the other organs and also on the physical conditions which can modify its reactivity.

Recent researches have demonstrated that the human organism with all its different departments works as a whole, that an alteration in function in the form of over- or under-action or of altered action of one part may disturb the activity of other and distant portions of the body. Our knowledge of this comparatively new branch of anatomy and physiology has advanced rapidly and certain principles have been laid down which promise to assist materially in enabling us to understand many disorders which up to the present have remained unexplored and obscure. But at present we are only on the fringe of the subject. We find, however, in the works of Castellino and Pende and of other observers, a collection of data which enables us to see how readily the nervous system can be affected by the secretions of the endocrinic glands, to what an extent the activity of these glands is dependent on their connection with the nervous system, and also how largely the symptoms and course of many physical and mental illnesses can be influenced by a disturbance of their functions.

In carrying out their investigations on diseased conditions, Castellino and Pende have made use of the principles enunciated in the original works of Gaskell and Langley regarding the nervous system and the endocrinic glands. The first principle referred to is that of the recognition of the two distinct branches of the vegetative system, viz., the autonomic, that is the portion which does not provide centrifugal rami communicantes to the ganglia which lie on the bodies of the spinal column but is found in close relation with the 3rd, 7th, and 9th cranial nerves and with the three first sacral nerves; and the sympathetic portion which forms the chain of ganglia that receives the rami communicantes from the spinal cord and it also includes the visceral ganglia. These two portions of



the vegetative nervous system, both of which take part in the innervation of the viscera, are antagonistic to one another in regard to the separate functions of the organs. This antagonism, which may be described almost as the central fact of the physiology of the sympathetic system, is obvious not only in the matter of controlling function but also in the reaction of the two portions to drugs. Drugs such as pilocarpine and physostigmine stimulate the autonomic system and not the sympathetic, while adrenalin stimulates the sympathetic system and not the autonomic.

The second principle is that the secretions of the various endocrinic glands have a selective action on the two sections of the vegetative nervous system, and it is on this selective activity that the complex activities of blood-supply and of metabolism depend. Thus it is found that adrenalin stimulates the whole sympathetic system, acting on some organs as an excitant, on others as an inhibiting agent; the pituitary secretion stimulates the autonomic system. It is supposed, therefore, that the tone and the excitability of the autonomic and of the sympathetic systems are regulated by glandular products which are poured into the blood-stream. It is they which maintain an equilibrium between the two systems.

The third principle is based on the fact that there exist special correlations between these glands. Experimental physiology demonstrates that the secretion of one may stimulate some of these glands to activity and inhibit others, that is, that there exists a reciprocal reaction between them, in some cases a stimulation, and in others an inhibition. For example, the chromaffin tissue stimulates the thyroid and the pituitary body, and the secretion of either of these produces a similar result in the chromaffin tissues, and each of these three glands can hinder the secretion of the pancreas and possibly of the thymus and the parathyroid bodies. There is also an antagonism between the secretion of the interstitial gland of the testicle and that of the thyroid and of the pituitary body. The antagonism between the autonomic and sympathetic nervous systems, which has already been referred to, may depend therefore on the different secretions of the endocrinic glands, some of them stimulating and others hindering the activity of each system. The tone of the visceral nervous system will in that case be controlled by the influence of the secretions of these various glands and certain morbid syndromes may be



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the result of a disturbance of the equilibrium which exists normally between the nervous system and these glands.

On the assumption of the inter-reaction between these glands and the two sections of the vegetative nervous system, Eppinger and Hess have based their hypothesis that clinically it is possible to recognise two groups of symptoms, one dependent on the craniosacral section and termed by them vago-tonia, or, as Castellino and Pende suggest, autonomotonia, and the other produced by the predominance of the sympathetic section, and for it the term sympathotonia has been proposed. Many clinical observations have been collected which tend to support the possible association between the lymphatic and arthritic morbid conditions of young people (the lymphatic and exudative diathesis) with some disturbance of the autonomic system, and also an association between an inefficient action of the thyroid, lymphatic and thymic glands and the syndrome of Basedow, the syndrome of Addison and the syndrome of chlorosis. The researches of Pende tend to demonstrate on the other hand that it is the sympathetic system which is at fault when the case presents a tendency to tachycardia, hyperthermia, to an over-active metabolic exchange, to gastro-intestinal atony, to diminished secretion of saliva and sweat and to the preponderance of the vaso-constrictors over the vaso-dilators.

So far reference has been made only to the disturbed action of the vegetative nervous system and their association with the activity of these glands, but there is not wanting evidence which suggests that the whole nervous system may be influenced by these secretions. It has been established that the removal of the parathyroid glands gives rise to a hyper-sensitivity or hyper-reactivity of the nervous system as a whole and a morbid condition of these glands is admitted to exist in tetany. Achucarro has gone further and has proposed that the neuroglia acts as an endocrinic gland and that it secretes hormones which exercise an influence on the sensitivity and reactivity of the nervous elements of the central and vegetative nervous systems.

The centres of the vegetative nervous system which have been referred to so far are situated in the sacral, lumbar, thoracic, and cervical portions of the spinal cord, and also in the medulla oblongata and in the mid-brain. But from evidence collected by Ascher it is probable that there is a vegetative centre in the

corpus striatum and what he terms a diabetic puncture centre in the hypothalamus. He obtained manifestations of pain, slowing of the pulse, increase of blood-pressure, painful respiration, contractions of the bladder, intestine and pregnant uterus, on stimulation of the tuber cinereum. There is probably a sympathetic centre in the same region which, on stimulation, produces dilation of the pupil and secretion of sweat. He suggested that this centre influences not only the vegetative system but probably also psychic activities.

Other authorities have advanced even further and have provided evidence to support the view that there must be sympathetic centres in the cortex cerebri. Pighini has agreed with Bechterew that these highest sympathetic centres may take part in the psycho-reflex activity of the cortex, and instead of assuming the existence of separate centres of sensation, memory, and representation, it is suggested that in the cortex there is a series of sensory-motor regions with psychic functions. That is to say, there are anatomical paths which connect analogous sensory-motor centres, not only to the Rolandic area of projection, to the effector centres, but also to sympathetic centres controlling the sympathetic system on which the vaso-motor and secretory functions depend. The sympathetic system is therefore represented in the cortex and co-operates in the psycho-reflex processes. We have in this an anatomical basis which will assist in explaining many symptoms common in mental illnesses.

Castellino and Pende quote several investigators who have found lesions in the ganglia of the vegetative nervous system in cases of hypochondria, dementia præcox, senile dementia, in insanity associated with pellagra and in general paralysis.

Amongst the causes of morbid conditions of the vegetative systems the two which are most frequent and most active are (a) psychic trauma and mental worry and (b) the infections, intoxications, and, more rarely, physical injuries. In these last it would be difficult to exclude a psychic trauma in the nature of fright as occurring at the same time. That the infections can and do produce gross lesions of the sympathetic system was demonstrated by Dr David Orr and myself when examining the pre-vertebral ganglia in cases of pneumonia. The vessels were greatly dilated and in several instances hæmorrhages had occurred amongst the nerve tissues.

But there are other secondary results often caused through

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a morbid condition of the sympathetic system, namely, definite alterations in the vessels and in the nervous constituents of the central nervous system. In a series of experiments on animals carried out by Orr and myself, in which capsules containing a culture of *Staphylococcus pyogenes aureus* were placed in the abdominal cavity, there were produced extensive changes in the spinal cord, and in the brain when the capsules were placed against the carotid artery. In these experiments there was no histological evidence to suggest that the toxins derived from the capsules had spread by a direct path to the central nervous system. The histological changes which usually accompany the spread of a toxin, as, for example, when the capsule was placed against the sciatic nerve or by an intervertebral foramen, could be traced to the sympathetic ganglia situated in the abdomen but not beyond. The nerve-cells of the ganglion near to which the capsule had been placed showed signs of chromatolysis and the perivascular cells had reacted to the irritant.

But within the spinal cord the morbid changes were present invariably and exhibited every degree of reaction, from a simple dilatation of the vessels with slight hyaline degeneration of the capillary cells, œdema, and a little degeneration of the myeline sheath up to acute distension of the vessels, severe hyaline changes in the vessel walls and their contents, so that many vessels were blocked by thrombi. These conditions were accompanied by marked œdema, and the myeline sheath was in a condition of fragmentation, the axis cylinders were swollen, the neuroglia was reacting and proliferating and the nerve-cells also were affected. In the brain, besides changes similar to those mentioned, there were added definite foci of softening with all the usual attending phenomena and also an acute condition of coagulation necrosis of the nerve-cells in certain areas of the cortex. It was interesting to find that the degenerations were almost limited to the areas whose blood-vessels were derived from the pia mater and it is now proved that these pial vessels receive fibres from the sympathetic system and are controlled by them.

These conditions are the crude results of some severe disturbance of the vaso-motor system which may be recoverable or not according to the degree of disturbance and its duration. In some instances the process may advance beyond repair; in others repair is possible if the cause be removed. In the



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former instance secondary or Wallerian degeneration will be the result in the peripheral portion of the nerve.

But primary degeneration is equally important if less obvious, but it is less understood. Primary degeneration is the result of disturbed nutrition or of the action of a mild toxin and is a condition which is recoverable, although function may be temporarily disturbed. Experimental evidence supports this view. Even when the reaction is so acute in the nerve-cell as to lead to an intense chromatolysis and to pallor and displacement of the nucleus, recovery, as Lugaro has shown, can take place.

Undoubtedly less severe alterations frequently occur in the course of many illnesses. For example, in the intercostal nerves in pleurisy we sometimes discover the lesser changes which may affect a nerve fibre when exposed to mild nocuous influences. The only signs of degeneration were a few small fatty droplets in the myeline on each side of a node of Ranvier stained black by the Marchi method; the remainder of the myeline sheath was normal. In a disease like disseminated sclerosis, with its initial slight disturbance of function, the earliest phases demonstrable are represented by a simple degeneration of the myeline sheath, but the process must have existed for some time before it could become apparent by the application of such a crude method as staining by osmic acid. Earlier changes can be demonstrated by the method of Donaggio. But all these methods are crude to a degree, and we can easily imagine that the alterations depending on slight nutritional disturbances and still more so those conditions such as fatigue, leading to delayed and altered reflexes, as described by Professor Sherrington, must be infinitesimal and non-demonstrable. Quoting from the *Principles of General Physiology* by Professor Bayliss, we find that the conditions on which fatigue depends must be sought in the synapse. Bayliss refers to Sherrington's suggestion that the synapse, or contact surface of the terminations of the nerve processes, marks the limitation of the protoplasmic or nutritive continuity although physiological continuity must exist. Such a contact surface is of great functional importance since, as Sherrington says, "it might restrain diffusion, back up osmotic pressure, restrict the movement of ions, accumulate electrical discharges, support a double electric layer, alter in shape and surface tension with changes in difference of potential, alter in difference of potential



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with changes of tension or in shape, or intervene as a membrane between dilute solutions of electrolytes of different concentration or colloidal suspensions with different sign of charge ; in fact, all the numerous phenomena which have been shown to be of fundamental importance in the mechanism of the cell. There must be also manifold possibilities of excitation and inhibition." These, then, are the possible changes occurring at the synapses between the various neurons which Sherrington was led to postulate and recognise as possibilities, in order to explain the reactions between the elements of the nervous system which he observed in his experiments. It was physiological changes such as these, occurring in definite groups of neurons, which, leading to inhibition here and facilitation there, made possible the coadjustment of reflexes necessary for the orderly sequence of movements.

We are therefore now far removed from these gross degenerations which were referred to earlier in the lecture under the term "primary degenerations." The primary degenerations were mentioned because it is essential to recognise that although so gross as to be demonstrable under the microscope they are reparable and the nerve elements can regain their normal function. But the slighter changes suggested by Sherrington are physiological and form the basis of ordinary nervous activity. Sherrington's experiments have demonstrated also what little interference is required to disturb that normal function, and how these processes may be influenced even by extremely delicate causes such as fatigue, slightly altered nutrition, and, we may add, by emotional over-reaction, especially if long continued, and possibly by all stimuli which can interfere with the normal activity of the vegetative system and the endocrinic glands.

Equally important are the recent advances in the study of the anatomy of the nervous system, in its development as well as its final architectonic structure. Professor Elliot Smith, in the Croonian lectures, showed that the higher, more complicated evolution of the cortex of the brain served the purpose of allowing the further adaptation of the animal to its surroundings as communicated to it by its distance receptors. The first portion to appear was connected with the sense of smell. "With the evolution of the cortex the sensitivity to touch, smell, vision, and hearing became heightened and the influence of these senses so intimately integrated by revolutionary changes in the

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cerebral hemisphere as to make possible a much more complex and intelligent behaviour. The increasing significance of vision, hearing and touch found expression in the sudden growth of the thalamus and the development of larger tracts of fibres ascending from the thalamic nuclei into the lateral edge of the pallium which then expanded and bulged into the ventricle. The great mass of low-grade pallium, which may be called 'hypopallium,' thus formed represents the first relatively independent representation in the cortex of the senses of vision, hearing and touch. Then for the first time the cerebral cortex became an instrument whereby these senses played a combined part in controlling behaviour and added their quota to the discriminative side of the animal's consciousness."

In order that mental illnesses may be understood it is essential that the fundamental principles on which normal nervous activity is based should be investigated and that assistance should be sought from any branch of study capable of throwing light on these intricate problems. It will be recognised that the action of the nervous mechanisms concerned may be modified by alterations in the functions of organs intimately connected with but outside the nervous system. And therefore, although the brain is the "organ of mind" and although the seat of the processes underlying mental phenomena is to be found in the cortex cerebri, yet the interactions between the brain and the organs of the body as well as those between the organs of the body and the brain must be understood before we shall be in a position to comprehend and to explain the complex symptomatology of functional mental illnesses.

Let us now consider some of the mechanisms of the central nervous system on which its normal activity depends.

The chief function of the cortex is to provide for an appropriate adjustment to the varied combinations and changes of the outer world. It will be remembered that Professor Sherrington has described reflexes as adapted reactions and that he has stated that reflex reaction cannot be made intelligible to the physiologist until he knows its aim, which is to dominate the environment. The more numerous and extensive the responses made by the creature to the actions of the world around on its receptors, the more completely will the bundle of reflexes—and that the creature is—figure the complexity of the world around. With the nervous system intact, the reactions of the various parts of that system,

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the simple reflexes, are ever combined into greater incitatory harmonies and the sequence of their actions constitutes the behaviour of the individual as a whole. Dr Head has shown that the cortex is an organ the function of which is to endow stimuli with spatial and time relationship, with the power of responding in a graduated manner to stimuli of graduated intensities and with those qualities by which we recognise the similarity or difference of objects brought into contact with the body. It is also the activity of the cortex which allows a choice to be made. An anatomical lesion upsets the orderly sequence of physiological processes and this defect of function is manifested in disorder of the psychical act of sensation. A sensory loss of cortical origin is not expressed in anatomical or physiological terms but in those of the most elementary processes of mind. Head also showed how in the progress of development in the animal kingdom the higher centres of integration appear one after the other and how the activity of these centres can be recognised in man, the lower being controlled by the higher and more recent additions, until we have in the cortex of the brain the supreme element of the nervous hierarchy.

Further illuminating evidence of the way in which reflexes can be augmented, modified, replaced, or inhibited by various influences even when the highest centres of the cortex are involved has been provided by Professor Pavlov of Petrograd. His work is so important that I venture to quote it at some length; in order to do this I rely on the publications of Professor Bayliss and Professor Cathcart.

In dealing with the higher centres, the result which follows a particular stimulus depends on a much greater number of conditions than in the case of the lower centres. In these the reactions can be reckoned on with remarkable regularity, but in the higher centres so many different parts of the nervous system must be brought into relation with one another and their activities co-ordinated; so many combinations are possible that it is difficult to discover the mechanisms underlying the various processes concerned in the higher functions. Bianchi, some twelve years ago, suggested that all mental activity, even the highest capacities of the mind, are manifestations of reflex activity. Pavlov, by his studies on the effects of different stimuli under varying conditions in dogs, has been able to establish that reflex reactions form the basis of many activities



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which include some complex mental processes. He drew a distinction between the lower primitive reflex reactions, such as the flow of saliva when food is presented to a dog which he calls an unconditioned reflex, and the conditioned reflex which depends on much more complicated processes during which various "temporary combinations" are formed. This distinction, however, is one of degree and not of kind.

In his experiments he found that if a new, indifferent, external stimulus be repeatedly presented along with one which already calls forth a definite response, the subsequent presentation of the new stimulus alone will cause the reflex to be given. The reflex arc has taken into connection with itself an additional afferent neuron, but not for indefinite time or unconditionally.

Pavlov started from the simple phenomenon that in the dog the presentation of food gives rise to a secretion of saliva. But if every time the food is given a particular bell is rung, after a number of repetitions of the combination of bell and food the sound of the bell alone is sufficient to cause secretion of saliva. A conditioned reflex to the sound of the bell has been formed. The reflex action of the secretion following food being taken into the mouth may be present when the higher parts of the brain have been removed; this is the primitive unconditioned reflex. But it can be modified, for the sight or the thought of food may lead to the secretion of saliva and fear may inhibit it. Such reactions represent conditioned reflexes and depend on the activity of the higher centres situated in the cortex cerebri.

These can be influenced by external and internal stimuli. Any phenomenon of the outer world, for which the animal possesses appropriate receptive organs, can be brought into temporary association with salivary secretion so that it can become an exciting agent to secretion if only it has been frequently presented at the same time with the unconditioned reflex, viz., food in the mouth.

Pavlov studied the different kinds of stimuli and their effect on one another. Seeing that a great number of stimuli of various kinds may be presented at the same time there is a great variety of possibilities of inhibition and of these Pavlov distinguishes two kinds, external and internal. All kinds of external phenomena may give rise to external inhibition. Any slight disturbance may prevent the production



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of a conditioned reflex, especially during the early stages of its formation. As an example of the formation of an internal inhibition he points out that the withholding of the presentation of food a few times leads to a failure to excite secretion.

He then referred to the analysers or sense organs—mechanisms of sensation whose function it is to separate and distinguish the complicated phenomena of the outer world. He gave the example that when a certain combination of stimuli, arising from the retina and eye muscles, has several times been found to coincide with the touch stimuli of an object of a given size, the combination becomes the conditioned stimulus of the actual size of the object. And, as has been shown in detail by Dr Head, the analysers are not the peripheral receptors alone: the analysis is continued by the mechanisms situated in the central nervous system and these are very complex, often involving the highest centres.

Pavlov, however, established other complex reflex reactions in the dog. He showed how the method of conditioned reflexes allows of the testing the delicacy of the appreciation of external forces. A dog in which a note of 100 vibrations per second has been made into a conditioned stimulus by presentation along with food, so that later secretion results from it alone, will not respond to a note of 104 or 96 vibrations. A similar conditioned reflex to electrical stimulation of a spot on the skin ceases to appear when the electrodes are moved 1 cm. away. This differentiation is brought about by inhibition, that is, by exclusion of the activity of all parts of the analyser with the exception of the limited section concerned. It is important to note also that a stimulus such as an electric current sufficiently strong to give signs of pain when applied to the skin before it has become a signal for the conditioned reflex, ceases to produce pain after it becomes a signal for the conditioned reflex and gives rise to the secretion. But if applied 1 cm. away from the given spot it produces signs of pain and there is no secretion.

The time factor also could be introduced into the conditioned reflex by presenting food at a given interval, say two minutes after the stimulus, *i.e.*, the bell, had been applied. It was found that after sufficient repetition the secretion commenced two minutes after the bell has been sounded. This showed that something has been going on in the centres but that its manifestation had been inhibited. But if some indifferent

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stimulus was given during this interval secretion was started at once. This experiment proved, therefore, that the inhibition which delayed the commencement of secretion could itself be inhibited by an indifferent stimulus—that is to say, we have an inhibition of an inhibition.

A further experiment showed that a conditioned stimulus could be made an inhibitory one. Suppose that a sound and a light are made each for itself active, that is, associated with the presentation of food, then if both are presented at the same time no secretion follows, that is, the combination is made inactive, the one must inhibit the other. Also, if one be presented alone and be followed by secretion, and then the other, also active by itself alone, is presented, the secretion stops because the combination of the two is inactive.

Now, during a conditioned reflex the whole of the cortex, except the part in action, is inhibited; and if the stimulus is not followed by presentation of food, so that internal inhibition of that also takes place, there is a tendency to total inhibition and sleep. Sleep itself may be associated with food and be excited by a conditioned reflex. A lullaby may be a conditioned reflex to send a child to sleep.

Another interesting fact is that removal of an area of the cortex cerebri damages permanently any conditioned reflex in which that area has been concerned. It was found that when a certain large area of skin had been made a conditioned stimulus for the feeding reflex, the removal of parts of the frontal lobe abolished the conditioned reflex from a particular sharply defined area of skin. On stimulation of the ineffective skin area, there is, however, a strong inhibition of the effect from an active area. It leads also very quickly to drowsiness and sleep. If the whole cortex is removed no conditioned reflexes can be formed at all.

Pavlov therefore has brought forward evidence to prove that some of the functions of the cortex, which include some of the higher capacities, are of the nature of reflexes. He has shown that not only stimuli from the outer world but also some internal stimuli, for example the thought of food which stimulates secretion of saliva and fear which inhibits it, can influence ordinary reflex activities.

In the works of Sherrington, Head, Pavlov and others we find connected with the simpler reflexes two important processes acting which play a fundamental part in determining a co-

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ordinated reaction, viz., facilitation and inhibition ; and it would seem that facilitation is an active process and not merely a cutting off of disturbing influences by inhibition, and inhibition itself is an active process—on it depends the co-ordinated action of the movements concerned in carrying out the reflex and also the sequence of movements which depends on the co-adjustment of reflexes so that no confusion occurs. It is known that such influences as fatigue, intoxication and altered metabolism give rise to altered or delayed or even reversed reactions. Pavlov has shown that the arrival of other stimuli can put a stop to a conditioned reflex which has been acquired and which has yielded uniform results when undisturbed. That is, there may occur an inhibition of an inhibition. These processes, therefore, form the basis of co-ordinated reaction in the lower reflexes. They are essential also for clear consciousness in the higher realms of thought and behaviour. Without them there could be only confusion.

It is evident, then, that the activity of the cortex cerebri is required in order that reactions such as those referred to may take place. Head has shown that the psychic phenomenon of sensation and of differentiation depend on processes occurring in the cortex ; Pavlov has demonstrated that if the cortex be removed no conditioned reflex can be formed and if one has been established removal of a portion of the frontal lobe will cause it to disappear. The appropriate adjustment of the organism to the varied conditions of the outer world in a simple conditioned reflex, such as the case of the bell and the secretion of saliva, as well as in more complex reactions, must be assumed to depend on reactions produced by psychic factors. Cathcart, recognising the power of psychic influences to modify the digestive processes, aiding it or hindering it as the case may be, has suggested that what is generally spoken of as a psychic secretion is in reality a reflex secretion.

*(To be continued.)*



## STUDIES ON INFLUENZAL PNEUMONIA AND ITS TREATMENT.

(From the Internal Clinic at the University of Lund, Sweden.)

By PROFESSOR KARL PETRÉN.

(Continued from page 49.)

### THE NATURE OF INFLUENZAL PNEUMONIA.

When I reflect on my whole experience of influenzal pneumonia, my general impression is that *this disease must, to a very marked degree, be considered a typical one.*

It may perhaps be replied that this may be quite true for ordinary influenza, but that influenzal pneumonia is an occasional complication which is due to irregular secondary infections, and of course it is well known that different micro-organisms have been found in many or most of the different cases of influenzal pneumonia, especially streptococcus and pneumococcus. I can only answer that, as regards the theoretical question, I hold a totally different opinion. I admit that differences exist between different cases, but the same is true of all acute infectious diseases, even those which we recognise as the best examples of typical diseases, such as diphtheria, poliomyelitis, and many others. But the difference between individual cases of influenzal pneumonia are in general no greater than those we see in these recognised typical diseases.

Pneumonia occurs in a very large percentage of cases of influenza. I and many others have shown that the pneumonia generally sets in a very few days after the influenza has begun. Now, if the pneumonia is a simple complication of influenza due to a secondary infection, how can it be explained that this complication always occurs in the same organ and not in different organs? Certainly, in some cases one finds complications affecting other organs, but then these complications occur only after the influenza has already caused pneumonia, and they present themselves, if we exclude pleurisy, only in very rare instances.

If we compare them with typhoid, how great is the difference! Complications following typhoid occur in the most different organs. Each of these different complications is seen in comparatively few cases, and occur, in general, relatively late



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in the course of the disease, and at very different periods during the long course of the fever. In influenza, on the other hand, the "complication" occurs in one organ—generally at the same period of the illness—only a few days after the influenza has appeared. It thus forms a typical clinical picture. The contrast from this point of view could not be more striking.

One may perhaps reply that pneumonia only exists in some cases of influenza and only in the minority of these cases, and consequently that it must be considered as a complication. In my opinion, influenza must be regarded both as a general infection and as a local infection of the mucous membrane of the respiratory tract. In this epidemic we have had ample experience of how acute the affection of the trachea has been, and I think it is quite probable that the dry, very irritable cough in influenza is due to tracheitis. This local infection, which is typical of influenza, can descend to the bronchi or even to the lungs; in other words, the inflammation has in such cases (starting from the vantage-ground of the bronchioles) attacked the air vesicles in greater or smaller degree.

According to this view, *the bronchitis and the pneumonia of influenza are only different degrees of development of the same local morbid affection*. We all know that, as a rule, one can determine the presence of bronchitis in influenza, and in a certain number of cases we can also recognise the occurrence of pneumonia. But if the pneumonia is thus a later stage in the development of a local infection of the mucous membrane of the whole respiratory tract, many intermediate phases in the spread of infection through the lung must be passed through before a condition of pneumonia can be recognised. Fully developed pneumonia is recognised by the impairment of percussion, by the shadows on the screen on the examination by X-rays, or through the bronchial breathing; and it is quite easy to understand how long the development of the inflammation in the vesicles may go on before these signs appear. Hence, nobody can prove that there does not exist a certain amount of morbid affection of the lungs in all the cases, although the clinical observer cannot perceive the pneumonia.

It may be instructive to make a *comparison with poliomyelitis* which can serve as an example of a very well defined disease. The varying degrees of involvement in the different cases of this disease is very striking and extends from cases exhibiting paralysis of all the four extremities, perhaps even of the trunk—

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and which to a great extent persists during the whole life—to those which show only a slight paresis of one extremity which disappears in a few days and leaves no trace. Further, we know, originally through the observations of my late fellow-countryman, Wickman (but confirmed later by many others), that many cases of poliomyelitis occur where a definite paresis never sets in. Of course, one can be in no doubt that the definite specific affinity which exists between the virus of organisms of poliomyelitis and the tissue of the anterior horns of the spinal cord has been active here also; and that, in consequence, an inflammation in the cornua has existed in these cases also, although this inflammation has not attained to such a degree as to produce an interference with the function of the motor cells which would allow a clinical observer to recognise it.

Now, from our present point of view an enormous difference exists between poliomyelitis and pneumonia, inasmuch as in poliomyelitis the muscular functions which are involved offer perhaps the most sensitive clinical indicator that exists in all pathology, whilst in pneumonia, and especially in basal pneumonia which is the commonest type in influenza, how massive must be the morbid affection to allow the clinical observer to recognise it in comparison with the slight microscopical affection of the anterior horns which is sufficient to render a paresis evident to a skilled physician.

I therefore feel justified in thinking that the grounds are very strong for the view that, in influenza, the inflammation of the pulmonary vesicles is from a certain point of view of the same nature as the inflammation of the bronchi, and that it seems very probable that a certain degree of involvement of the vesicles occurs in all, or, at least, in most cases of influenza.

Indeed, if we compare the different cases of influenzal pneumonia with each other, we must recognise that the differences between them are explained by quantitative factors. There are only a few differences between them that cannot be explained in this way, of which the principal one is to be found in the varying character of the sputum; otherwise the deviations from the general picture are but few.

Thus we arrive at the conclusion that *influenza is a typical disease; that influenzal pneumonia is part of the disease process, and finds its explanation in quantitative factors which determine the varying degree of development of the local morbid affection in the respiratory tract.*

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Just as the differences between the different cases are almost quite explainable by a quantitative factor, so also the varying severity of the disease is, in my opinion, explained through the same quantitative factor, as shown by the strong tendency in severe cases for the morbid affection in the lungs to spread and to become confluent.

I have already explained that I regard the severe cyanosis—so often the sign that death is threatening—as the direct consequence of the great extension of the morbid affection of the lungs, an extension which may be so great as to cause suffocation. Professor Sjoevall, who has performed the necropsies in many of my cases, concurs in the view that the extension of the morbid affection in the lungs, “at least in a great number of cases,” adequately explains the cyanosis and the dyspnoea. I have already emphasised how patients with chronic valvular disease, especially mitral stenosis, very readily succumb to influenzal pneumonia, but that this is not the case with patients suffering from chronic nephritis. The great danger for such forms of heart disease seems to me to be explicable on the supposition that in these cases the heart cannot keep up a sufficient circulation in the lungs, the more so because of the reduced area of lung tissue available for respiration.

Observations on cases of pulmonary tuberculosis which developed influenzal pneumonia whilst undergoing the Forlanini treatment by the induction of artificial pneumothorax point in the same direction. From the Sanatorium of Stockholm, Dr Gullbring has reported that all the seven patients who were treated by Forlanini's method, and who, during the second severe period of the epidemic, were attacked by influenzal pneumonia, succumbed. Dr Gullbring gives the following description of these cases:—“The rise in the frequency of the respiration and the superficial character of the respiration were the dominant features. A respiratory frequency of 40 was often seen. Sometimes attacks of dyspnoea supervened, when the respiration resembled a feeble gasping and the frequency increased to 60. In four cases the nitrogen was withdrawn from the pleural space as soon as respiration became difficult. As a rule, this was quickly followed by a subjective improvement, the pulse-rate and the frequency of respiration decreased and the cyanosis diminished. In one case the impression was received that, for the moment, life was saved.”



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Long before these interesting observations were published, I had expressed my views on the cause of the cyanosis in a paper written in Swedish, and now they seem to me to afford additional and experimental proof of the accuracy of my opinions. In fact, these observations demonstrate that the direct cause of the cyanosis and of other urgent symptoms has been the lack of lung tissue capable of maintaining respiration, since the expansion of the other lung and consequent increment of serviceable lung tissue brought about an immediate improvement both of cyanosis and dyspnoea.

We have thus, I think, arrived, with a high degree of probability, at the conclusion that both simple influenza and influenzal pneumonia are definite or "typical" diseases; and, further, that both are in reality of the same type, and differ from one another only in the degree of development.

If we compare the late pandemic with the description of the former pandemic of the disease in 1889-90, my impression is that we are again finding the same characteristic features both from the nosographical and the epidemiological points of view. Even if we go back, for instance, to the description of the older epidemics by Graves, we find a clinical picture which in most points corresponds with what we have now seen.

The most marked difference is perhaps that none of the earlier writers have described the same high degree of cyanosis which has impressed us so much. But the cyanosis occurred chiefly during the first period of the epidemic when the mortality was very high, and in my opinion resulted from the strong tendency of the morbid affection to spread and become confluent in the lungs. This very feature of the affection has also caused the cyanosis. Now, it seems to me evident that the recent epidemic has been much more severe than those of former times, and, if this is the case, we can understand that in the former epidemics the tendency to massive involvement of the lungs was not so great, and, consequently, cyanosis was a much less prominent feature.

So we conclude that the varying degree of cyanosis can be explained by the above quantitative factor, and, if so, the absence of severe cyanosis in the former epidemics cannot be considered as a ground for assuming anything beyond a quantitative difference between the different pandemics.

But an acute infectious disease, which appears only at certain epochs well separated from each other and which then reappears



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with identical clinical manifestations and anatomical changes, is—as all experience in pathology has taught us—*caused by a specific micro-organism*, typical of and specific to just this disease.

Such a micro-organism must be constant in the disease, and if a method of finding the micro-organism had been discovered we should find it in every case. If influenzal pneumonia is a typical disease it cannot be the consequence of an accidental secondary infection, for it is impossible that the same typical disease should be the effect of different infections in different cases—this would be contrary to all pathological experience.

Some years ago I discussed the question of the micro-organism of poliomyelitis on the same lines. This was shortly before the discovery was made that the disease can be conveyed to animals through inoculation. On this problem I expressed myself in the following words:—

“Comme je l’ai déjà dit, tous sont d’accord qu’il s’agit d’une maladie infectieuse, mais je voudrais encore ajouter qu’il faut conclure que la poliomyélite aiguë est une maladie infectieuse d’une nature spécifique. Je tire cette conclusion de ce qu’ont de si caractéristique, la forme du début de la maladie et la forme de la réparation des lésions anatomiques et enfin de ce que les symptômes de la phase de la paralysie sont en réalité toujours du même type.

“La concordance sur tous ces points capitaux des cas différents de la maladie constitue, à mon avis, une preuve suffisante qu’il s’agit, dans tous les cas, de la même forme d’infection, c’est à dire d’une maladie infectieuse spécifique.

“Une autre raison pour conclure à une infection spécifique comme cause de la poliomyélite aiguë, et sur laquelle je veux attirer l’attention, ce sont les résultats à peu près constants donnés par l’examen cytologique du liquide céphalo-rachidien dans la poliomyélite aiguë (à savoir qu’il s’agit exclusivement d’une lymphocytose); car notre expérience d’autres maladies nous a fait conclure que les formules cytologiques du sang et des autres liquides du corps constituent des caractères typiques et en général constants pour les différentes maladies infectieuses.

“On sait que divers auteurs ont trouvé pour la poliomyélite aiguë des micro-organismes différents dans le liquide céphalo-rachidien (Schulze, des méningocoques et dans un autre cas des diplocoques; Ellermann, des rhizopodes; Geirsvold, des diplocoques; Pasteur, Foulerton et Maccormac, des diplocoques;

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Forssner et Sjoevall, de même que Wickman, des staphylocoques, résultat que les auteurs regardent comme sans intérêt pour la question de l'étiologie de la maladie; Looft et Dethloff, des coqués très ressemblantes aux méningocoques; Harbitz et Scheel, des diplocoques; Barnes et Miller, des staphylocoques; Batten, des staphylocoques et encore d'autres formes de micro-organismes).

"Les considérations ci-dessus font que je suis convaincu que tous les cas typiques de poliomyélite aiguë sont dûs au même micro-organisme: par conséquent, puisqu'on n'a pas trouvé d'une manière constante le même micro-organisme dans tous les cas examinés, on ne peut pas, d'après mon opinion, accepter encore ces résultats comme la réponse définitive à la question l'étiologie de la poliomyélite aiguë."

The question of the virus common to influenza and to influenzal pneumonia I consider from exactly the same point of view. Therefore I believe that all the different micro-organisms that have been found in influenzal pneumonia have nothing to do with that virus which is the true cause of the pneumonia; and that, as a matter of fact, they are only "secondary" in respect of the pneumonia. From the same point of view, I regard it as quite impossible that the bacillus of Pfeiffer should be the true cause of influenza, since that micro-organism has not been found in all the cases.

We know that Bradford, Bashford, and Wilson have claimed that they have found the virus of influenza, and that it consists of very minute, rounded coccus-like bodies which can pass through a filter. As I only know their preliminary communication in *The British Medical Journal* of January 1919, on this subject, I cannot express any opinion on the value of their observations.

### NOTES ON THE TREATMENT OF INFLUENZAL PNEUMONIA.

I propose to deal with only a few points concerning treatment. If the pulse-rate is not low I usually give digitalis. My general dose *pro die* has been 0.30 or 0.45 g. of the drug (or the corresponding dose of digitotal, a preparation from the drug often used in Sweden). As it seems to me most probable that the cause of the cyanosis is not a severe intoxication, but the purely physical factor of insufficient lung tissue to sustain respiration, often associated with cardiac failure which adds to

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the embarrassment, the theoretical point of view offers good indications for the treatment with digitalis (when the pulse-rate is not too low), and after my experience it seems to me also probable that one may sometimes see a favourable result from this treatment. During the latter period of the epidemic I saw some cases with severe cyanosis which continued for some days and yet the patients survived. I still, however, have much hesitation in speaking dogmatically on the effect of digitalis in the individual cases.

In the autumn, when the epidemic was very severe (the mortality among the cases of pneumonia being 50 per cent.), I began to treat the cases with *neosalvarsan*. My reason for this was: (1) that the veterinarians told me of the very good result of salvarsan in a severe disease of the lungs in horses, and (2) that Professor Forssman who was working in the wards for venereal disease told me that the patients there were almost free from influenza, which I thought was perhaps a consequence of the treatment with salvarsan. Since then I have seen that some German authors have also tried neosalvarsan.

I first used injections of only 0.3 g.; and if the patient was able to bear this I increased the dose to 0.45 and later to 0.6 g. Since then—with only a few exceptions—we have always used 0.6 g. The only inconvenience I have observed from its use is that vomiting occurs in some cases. On this subject I have written this year (1919) in *The Lancet*. Otherwise no disturbance of any kind has been observed as a consequence of the injection. In general we have only given one injection to every patient, but in some cases in which the first injection seemed to have been of use but in which the condition subsequently grew worse, we have tried a second injection.

We began the injection with neosalvarsan immediately after the 1st October. The table already given, showing the mortality in the different months, demonstrates that the mortality considerably decreased from that time. In my opinion, however, we must conclude that this decrease—at least to a great extent—was due to an alteration in the character of the epidemic itself which set in at the same time. That such an alteration in the character of the epidemic occurred is very distinctly demonstrated by the longer course of the disease in the surviving cases in the latter period of the epidemic in comparison with the former.

We treated altogether 115 cases of influenzal pneumonia



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with neosalvarsan ; of these thirty-five (30 per cent.) died. It must be remarked that some cases ended fatally on the same day that the injection was given and others on the following day, and it is doubtful whether these cases should be taken into consideration in judging the effect of the treatment. It seems to me, however, that, in any case, our present statistics are insufficient for determining the question whether the neosalvarsan has had a favourable effect or not.

In eighteen cases I saw a marked fall of the temperature on the day after the injection. Whether the fall might not have occurred if no injection had been given I cannot tell, but my impression is that since so many of the cases treated with neosalvarsan showed a marked fall of temperature, which continued until the time when the fever disappeared, and so many of these cases also showed such marked improvement of the general condition, it is *quite probable that neosalvarsan has really been of good service*.\*

Later we also used "reconvalescent" serum in our clinic. We prepared it in the ordinary method—the clot was allowed to form, the serum was pipetted off, a Wassermann test was made. Cultures were taken, carbolic acid to the amount of 0.3 per cent. was added to the serum, and the sterility tested. Professor Forssman carried out this work in the Institute of Pathology, and I thank him most heartily for his valuable help. In general, we used 50 c.c. of serum, and, with but few exceptions, where technical difficulties rendered it inconvenient to insert a needle into the vein, this was given in intravenous injection. We always had difficulty in getting the requisite amount of serum, and were therefore not able to give it as often as we should have wished. We often observed excellent effects from the injection, and so we used the serum in the most severe cases, where it seemed to us necessary to employ the best means that were available.

We began the serum treatment after the middle of October. We used it in 113 cases ; in forty-three of them both serum and neosalvarsan were injected, and these forty-three cases are not excluded from the 115 cases mentioned above where salvarsan was used. Among these 113 cases thirteen were given two

\* Other clinicians seem to have had a similar experience ; thus Alexander says that he has often seen a favourable influence from the injection of salvarsan in influenzal pneumonia, and Schemenski has also noted good effects from this treatment.



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injections and in one case we gave three. The issue was fatal in thirty-five of these cases (mortality 30 per cent.). If we take into consideration one-third of the cases for October (the injections were begun on the 19th October) and all the cases during the following months we have a total of 222 cases, amongst which sixty-three were fatal, and, if we leave out the cases treated with serum, there remain 109 cases, and among them twenty-eight fatal (only 26 per cent.), but as we had not sufficient serum to treat any except the most severe cases, it is evident that these statistics permit of no conclusion. We must, therefore, analyse the individual cases.

Among thirty-five fatal cases death occurred in ten on the day following the injection, and it may well be questioned whether the injection did not come too late to be of any use. Among the seventy-eight surviving cases we had in thirty-one a very marked fall of temperature immediately or almost immediately after the injection, and generally in these same cases also a favourable influence on the general condition of the patients. We therefore find that a marked fall of the temperature occurred relatively oftener after the injection of serum (in 40 per cent. among the surviving cases, in 27 per cent. if we take all the cases that were treated into consideration) than after the injection of neosalvarsan (here in only 22.5 per cent. among the surviving cases and in 16 per cent. among all the cases treated). As only the most severe cases were chosen for the treatment with serum, I find in this difference between the cases treated with neosalvarsan and with serum strong evidence that serum had a favourable influence on the disease—a proof which is only the more certain because even neosalvarsan sometimes exercised a distinctly favourable influence on the disease.

To the statistical proof of the favourable effect of serum treatment to which we have thus been indirectly led, I can also add my general impression that in a fair number of these cases, where the prognosis seemed to be very threatening or even bad, I have seen an injection lead to a marked and permanent improvement in the general condition.

I must therefore conclude that *the injection of reconvalescent-serum is a treatment which often does good service.*

In concluding this paper I wish to pay the most hearty thanks to all my assistants who have most effectually helped me to collect and analyse the clinical material, and especially I

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thank my two assistants, Docent Sv. Ingvar and Dr Ruth Johansson, who have been indefatigable in helping me; indeed Dr Johansson has executed almost the greater part of the work for this study. Further I wish to express my cordial thanks to cand. med. Ellen Persson, who has given me valuable help in the study of the literature required for this paper.

In the winter of 1919-20 we had a recurrence of the influenza epidemic. The number of cases was not great, but the character of the disease was almost the same as before. Many of the cases were serious, but extreme cyanosis seldom occurred. The gravity of the illness is evident from the fact that seventeen of the forty cases of influenza in my wards proved fatal, *i.e.*, 42.5 per cent. It should be remarked, however, that only the most acute cases were admitted to the clinic.

I found it rather more difficult to discriminate between influenzal and lobar pneumonia from the physical signs and symptoms than I did in the epidemic of 1918-19; but when I used the X-rays it was possible to differentiate the two diseases. Respecting the morbid anatomy of these diseases, my brother, Ebbe Petré, Physician to the Hospital for Contagious Diseases in the town of Malmö, who has performed autopsies on almost two hundred cases of influenzal pneumonia, has stated at the Medical Association of Malmö that he has always found characteristic differences in the morbid anatomy of the two diseases. Generally, as we have seen, influenzal pneumonia has not attacked a whole lobe, but has shown itself in scattered foci, which may become more or less confluent. In some cases, however, my brother found that a whole lobe had become affected, but in these cases also it was possible to demonstrate that the whole lobe had not been involved at one time—as in lobar pneumonia—but that various stages of development could be noted in the lobe. One could therefore assume that such cases represented a late stage, approaching confluence of the original foci, and this is often a strongly marked characteristic of influenzal pneumonia.

If we compare the results of these autopsies with my studies with the fluorescent screen we find that they are in complete agreement. For the fact that in influenzal pneumonia the whole lobe is never affected simultaneously by the morbid processes explains why we never find a homogeneous shadow on the screen.

Comparing my experience of X-ray examination in the two

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epochs of the epidemic, I may say that during last winter (1919-20) the shadows were not, as a rule, so developed as in the first period of the epidemic. This result corresponds with the fact that cases of severe cyanosis were much rarer during 1919-20.

Our experience regarding *the number of white blood corpuscles* in the different epochs of the epidemic seems to me to be of great interest. In the first two months of the epidemic, September-October 1918, a fairly large number of cases showed pronounced leucopenia, whilst comparatively few showed leucocytosis. Later on, in the winter of 1918-19, this feature of the epidemic changed, leucopenia was rarely seen, and cases with leucocytosis became much more frequent. We were surprised to find that in the autumn of 1918 the tendency to leucopenia was even more striking than in the first epoch of the epidemic. These facts will be more easily appreciated if tabulated:—

Number of cases of Influenzal Pneumonia.	In Sept.-Oct. 1918.	In the later part of the epidemic. 1918-19.	In the epidemic 1919-20.
With 5000 white blood corpuscles . . .	23 per cent.	8 per cent.	47 per cent.
With 10,000 white blood corpuscles . . .	22    „	52    „	9    „

Thus we observe that this feature of the disease, viz., the influence on the number of the white blood corpuscles, has undulated in a marked manner during the different epochs of the epidemic.

It is evident that the cause of these changes in the type of the disease must lie in a change in the biological character of the micro-organisms of influenza. So far as I know, no other record exists of any corresponding undulatory movement of the biological characters of a pathogenic micro-organism.

Just as I had finished this paper I received through the kindness of my colleague, Lundsgaard, his' researches on cyanosis published in the *Journal of Experimental Medicine* for September 1919. He has used Van Slykes' method of measuring the venous oxygen and carbon dioxide in normal persons during different conditions, and also in some diseases, and amongst them in cases of influenzal pneumonia. He has found that the determination of the degree of the non-saturation of O in the venous blood is the most important point in judging the pathogenesis of cyanosis. The results of his researches in



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influenzal pneumonia are that the cyanosis for the same degree of want of oxygen-saturation in the blood is often more strongly developed in this disease than in other diseases or in normal persons under various experimental conditions.

Lundsgaard shows that the cyanosis is principally due to the colour of the blood in the capillaries, that is to say, to the average of the colour at the beginning and the end of the capillaries, or, in other words, to the average between the blood of the arteries and of the veins. The average degree of oxygen non-saturation seems therefore to be the most important factor in the pathogenesis of cyanosis. But as we see that the cyanosis of influenzal pneumonia is relatively strongly developed, although the degree of venous oxygen non-saturation is not excessive, we must conclude that the degree of non-saturation in the arteries, *i.e.*, at the beginning of the capillaries, is relatively great, which causes the average of the colour of the blood in the capillaries to be relatively high, and this is the cause of the cyanosis. If this is so, we must conclude that the reduction of the saturation of the arterial blood in the capillaries has decreased in comparison with normal conditions. Such a decrease of the reduction can, however, be most easily understood if it is due to a more rapid blood-flow through the capillaries. We are led, therefore, to the conclusion that the blood-flow in influenzal pneumonia is on an average rather faster than normal. If the cyanosis had been the consequence of a toxic factor, we should expect this to act through vasomotor mechanism and to make the blood-flow in the capillaries slower.

We thus see that the interesting researches of Lundsgaard confirm those ideas on the pathogenesis of cyanosis in influenzal pneumonia at which I had arrived through an analysis of the symptoms, ideas which Gullbring's observations, to which reference has already been made, also support.

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## RESECTION OF THE COLON BY THE THREE-STAGE METHOD

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RESECTION of the large intestine followed by immediate anastomosis is an operation which is associated with a considerable mortality, even when the operation is undertaken in the most favourable conditions. The semi-solid contents of the colon are apt to become arrested at the site of the union, and to exert injurious pressure on the sutures, with the result that ulceration and cutting out of the stitches are liable to follow. When obstruction has been present in the large intestine, previous to the operation, such a course of events is almost certain. The walls of the intestine above the obstruction are thick, congested, and sodden, and sutures will almost invariably cut out of such unhealthy material. Moynihan<sup>1</sup> makes the remark that "few rules are so binding upon the surgeon as that which prohibits the resection of growths, and subsequent end-to-end anastomosis of the large intestine in cases of acute obstruction." An exception may sometimes, perhaps, be made in the case of a tumour involving the right portion of the colon where the operation of ileo-cæcal resection is possible.

In deciding upon the operative treatment in cases of acute obstruction of the large intestine, there is a choice of one of three procedures:—(1) The operation may be limited in the first instance to the relief of the obstruction by colostomy, cæcostomy, or even appendicostomy, and a second laparotomy performed later to remove the cause—most commonly a malignant tumour. (2) In a few cases, when the obstruction is of minor degree, an anastomosis may be performed between the ileum and the colon below the tumour, the underlying cause being dealt with later. (3) A two- or three-stage operation after the method of Paul and Mikulicz may be carried out. The first and second methods both, as a rule, necessitate a second laparotomy for the removal of the primary cause, an operation for which the patient is often seriously unfitted by the previous obstruction, and from which he not infrequently succumbs. Paul,<sup>2</sup> in his classical paper on the operation by stages, emphasised the profound and prolonged effects of an attack of intestinal obstruction, and the marked lowering of the patient's resisting

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power which results, especially where there has been fæcal vomiting.

I have been so much impressed with the excellent recoveries which patients make when the colon is resected by the stage method, that it seemed worth while to quote the cases which came under my care during the earlier period of the war, when I had the privilege of carrying out numerous emergency operations. They show, at least, that even in the hands of an operator of comparatively limited experience, satisfactory immediate results can be obtained by dealing with the colon in this way. In all the cases the steps of the operative treatment were on the lines of those recommended by Thomson and Miles in their text-book of Operative Surgery, the operation being divided into three stages. In Paul's original method the first and second stages of the present method were carried out at one sitting, but the delay in the removal of the loop of bowel almost certainly diminishes the shock of the primary operation, and the subdivision into three stages is probably the better procedure. The *first* stage consisted in bringing the loop of bowel bearing the tumour or other pathological condition well outside the abdomen, fixing it there, and if possible suturing the two limbs at the base of the loop together. A Paul's tube with colostomy tubing attached was then tied in above the tumour to give relief to the obstruction. The *second* stage, carried out about a week later, consisted in the removal of the loop of bowel with the attached mesentery at the base of the loop, almost flush with the abdominal wall. For this stage no anæsthetic is required, though in the case of a tumour of the transverse colon it was found advisable to inject a little novocain into the mesocolon on account of discomfort produced when the tumour was dragged upon. With the local anæsthesia the operation was comfortably carried out. After removal of the loop of bowel, a Paul's tube was tied into each divided end of the intestine with the object of preventing hæmorrhage from the cut surfaces. The two open ends then lay side by side at the surface of the abdomen like the barrels of a gun. After the tubes become separated, the ends show a considerable tendency to retract inside the abdominal cavity. The *third* stage of the operation consists in the closure of the fæcal fistula. This was encouraged in the first instance by the application of the enterotome of von Mikulicz to the spur or septum between the two ends of the bowel. When the spur has been destroyed, the



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intestinal contents begin to find their way by the normal route, and the fistula then shows a remarkable tendency to spontaneous closure. When the opening has become of small size, the process can be readily completed by injecting a little local anæsthetic and dissecting the mucous membrane free from the skin around the orifice. When the intestinal wall has been freed a little and inverted, the fistula usually closes without further trouble. The cases are mentioned in their chronological order.

CASE I.—Female, aged 69. Admitted to Ward 15 of the Royal Infirmary on 12th August 1915. This patient had always enjoyed good health until about a week before admission. One week before admission she began to suffer from shooting pains in her abdomen, which she described as resembling “after-birth” pains. About the same time she began to have attacks of vomiting, the vomited material resembling “strong coffee.” She took to her bed, but did not think it necessary to call in her doctor until the day before admission. Constipation had been almost complete during the eight or nine days before she came to hospital. On the morning of the day of admission she noticed that the abdomen had become much swollen.

On examination, the patient looked pale and rather ill. She was thin but of a wiry type. The temperature was 97.4°F. and the pulse 88. The abdomen was markedly and uniformly distended, and was hyper-resonant on percussion. No appearance of peristalsis was visible. In the left iliac region a hard mass about the size of a closed fist could be distinctly made out. It was freely movable and was not tender. Rectal examination revealed nothing further.

An incision was made in the left inguinal region and a carcinoma of the pelvic colon exposed. A loop of bowel with the tumour was drawn out of the wound and fixed to the parietes. A Paul’s tube was then introduced into the bowel above the tumour. On the 19th of August—a week later—the second stage of the procedure was carried out. The mesentery of the protruding loop was grasped with strong forceps and the loop cut away. The vessels of the mesentery having been ligatured, a Paul’s tube was tied in each cut end of the bowel. On 2nd September a von Mikulicz’s enterotome was applied to the spur between the two ends of the bowel, and again on 16th September, by which date fæces had commenced to pass by the normal route. On 2nd October under local anæsthesia the edges of the fæcal fistula were freed from the skin and the opening closed. The wound gave way slightly afterwards, but healed without difficulty, and the patient was discharged on the 28th of October.

CASE II.—Male, aged 50. Admitted to Leith Hospital on 13th

## Resection of Colon by Three-stage Method

September 1916. This case was of a similar nature to the preceding one but presented the complication of an abscess alongside the tumour. He had been suffering from intermittent attacks of abdominal pain for five or six months before admission. These attacks were associated with great difficulty in getting the bowels to act but were not accompanied by vomiting. On examination an ill-defined swelling was present in the left iliac fossa, and, the temperature rising to  $100^{\circ}$  F. two days after admission and then to  $101^{\circ}$  F., it was evident that a collection of pus was present. This abscess was opened and drained on 19th September. As the induration around the abscess subsided, an underlying hard mass became palpable, which in conjunction with the previous history suggested a malignant tumour of the colon. On 5th October the abdomen was opened and a carcinoma of the pelvic colon exposed. This was mobilised as far as possible and the loop of bowel bearing the tumour was brought outside. Owing to fixation as the result of the inflammatory process the two limbs of the loop could not be brought into such close apposition as was desirable. A Paul's tube was then tied in above the tumour as in the previous case. The second stage was carried out on the 14th October. The closure of the fæcal fistula presented great difficulty, owing probably to fixation of the bowel above and below by inflammatory adhesions, so that the ends were not able to retract in the way they usually do. The enterotome was applied on the 15th December, and on several occasions afterwards, but the fistula refused to close and the patient was finally sent home with a fæcal fistula still present. I saw him in February 1920, and he reports that he has been doing his usual work—that of a painter—since a short time after he left hospital. He still has a small fistula from which there is a slight escape of fæcal matter. This gives him little inconvenience and he is not at all eager to have it closed.

CASE III.—Male, aged 50. Admitted to Ward 16 of the Royal Infirmary on 27th December 1917. This case differs from the others in being an example of acute obstruction due, not to a carcinoma, but to volvulus of the pelvic colon. For about three months before admission the patient had been troubled with vague pains in the lower abdomen. At 8 A.M. on the day of admission he was suddenly seized with intense abdominal pain, which was so severe that he had to lie down. He vomited repeatedly and the pain persisted undiminished until the time of operation.

On examination, the patient was found to be a spare, elderly man, who looked considerably older than his years. He was suffering from shock and was in a weak and exhausted condition. There was general tenderness over the lower part of the abdomen. Operation was performed about 7 P.M., there having been some delay in getting the patient transported to hospital. The twisted pelvic colon was

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much distended and acutely congested. It was necessary to tap the distended loop before the twist could be undone. When reduction had been effected, the viability of the affected loop appeared extremely doubtful, and it was not thought safe to return it into the abdomen. It was obvious that the patient would stand very little further strain, and it was decided to limit the operation to bringing the loop completely outside the abdomen. The two limbs at the base of the loop were fixed in apposition by a few silk sutures. A Paul's tube was tied in at the point where the trocar had been introduced. On the following day it was interesting to find that several small patches of gangrene were present on the protruding loop. The patient's general condition was much improved and the loop was accordingly amputated, about 16 inches of the elongated and distended colon being removed. A Paul's tube was tied in each end of the divided bowel.

The patient made an uninterrupted recovery from the symptoms of obstruction and the enterotome was applied as usual. I left for France before the treatment of this patient was complete. He went out in March 1918 with a fæcal fistula but was readmitted in May, when the fistula was closed by Sir James Hodsdon.

CASE IV.—Female, aged 57. This case was a carcinoma of the transverse colon. She was admitted to Ward 15 on the 12th January 1918. She had been suffering from severe colicky pains in the abdomen for three or four weeks before admission, accompanied by marked constipation. She had been in bed for a week before admission and vomited repeatedly. She noticed that the abdomen had become much enlarged.

On examination the patient was found to be a rather stout, healthy-looking woman. The abdomen was markedly distended but no palpable tumour could be made out. A mid-line incision below the umbilicus was made in the first instance and the tumour located. A second incision was made above the umbilicus and the tumour was brought outside. The transverse mesocolon was very short and the tumour could just be maintained outside by the support of a glass rod. A Paul's tube was tied in as usual.

The patient made an excellent recovery from the operation and the tumour was removed on the 18th of January. The enterotome was applied shortly afterwards. This case was also completed by Sir James Hodsdon after I had left for France. She went home in March with a fæcal fistula, but was readmitted in May and the fistula closed.

CASE V.—A fifth case which I had was the only unsuccessful one of the series and it is unfortunate that no record of the case is available. The patient, a female, was admitted to Leith Hospital with



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a carcinoma at the commencement of the transverse colon. Wishing to treat this in the same way as the others, I mobilised the right portion of the colon by dividing the parietal peritoneum on the lateral side and stripping the colon medially. It was then possible to bring the tumour completely outside. This patient did well for a few days and then quickly went downhill and died before resection of the tumour had been carried out. There was no post-mortem examination and the cause of death was not ascertained.

In all of the first four cases the recovery from the obstruction was most satisfactory. There was very little shock after the operation and none of these patients gave cause for any serious anxiety during their convalescence.

Removal of a portion of the colon by this method is open to many objections, especially when the cause of the obstruction is a neoplasm, as is most commonly the case. In dealing with obstruction from a carcinoma, although the first indication is to save the patient's life, it is necessary also to keep in mind the ultimate fate of the patient, and to give him, if possible, the opportunity of a radical cure of the disease. It may be said of the three-stage operation that it is too limited in its scope to render the cure of malignant disease a possibility. It is a fortunate fact in this connection that carcinoma of the larger bowel shows, as a rule, a low degree of malignancy. The development of the tumour is usually slow, and the invasion of lymphatic glands is generally late in occurrence. Jamieson and Dobson<sup>3</sup> have shown that the primary glands which receive lymph from the colon lie mostly close up to the bowel, and although a certain number of lymph-vessels pass directly to deeper glands situated alongside the main blood-vessels, invasion of these deeper glands appears to be frequently delayed for a long period. The glands lying close up to the bowel, which are most likely to be implicated, are removed by the operative procedure described above.

The present group of cases can be of little significance in relation to the cure of carcinoma by this method of treatment, but it was interesting and pleasing to find that Case II. is still alive and well, it being now nearly four years since the operation. If three years of immunity from a return of the disease be taken as an indication of probable cure of carcinoma, this case serves to show that a cure of the disease is possible by the three-stage method. I have been unable to trace Case I. Case IV. was seen in March 1920, and she now presents a large mass in the

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upper part of the abdomen, which is undoubtedly a recurrence of the carcinoma. The failure in this case to effect a cure of the malignant disease I attribute to the fact that the transverse mesocolon was so short that the tumour could not be brought sufficiently far outside the abdomen. When the second stage was carried out, one was compelled to divide the mesocolon close to the bowel so that infected glands, or a portion of infected mesocolon, may have been left behind. The patient at least had two years of active and useful life after the attack of obstruction.

A minor objection which is sometimes advanced against operations by the stage method is the discomfort of the presence of a fæcal fistula for a period of several weeks, or even months. It has been my experience that patients are extremely tolerant of the discomfort, especially if they know that the fistula is ultimately to be closed. In view of the urgency of the primary condition this drawback cannot be considered seriously. To sum up, it may be said that, in acute obstruction of the large intestine, although there are objections to resection of the colon by the three-stage method, in view of the grave condition of the patient, and especially his being severely handicapped by the effects of toxic absorption for a second and a severe operation, colectomy by this method is often the wisest procedure and may be quite satisfactory in its ultimate results. Even in the absence of acute obstruction, if a patient suffering from a carcinoma of the colon is feeble and in poor condition to withstand the strain of a severe operation, colectomy by the three-stage method has much to recommend it, more especially its comparative freedom from post-operative shock.

In conclusion I should like to express my great indebtedness to Sir James Hodsdon, owing to whose kindness I was enabled to operate on three of these cases, and who carried out the concluding and most tedious and difficult steps in two instances.

- REFERENCES.—<sup>1</sup> Moynihan, *Abdominal Operations*, vol. ii., p. 55.  
<sup>2</sup> Paul, "Colectomy," *British Medical Journal*, 25th May 1895, p. 1139.  
<sup>3</sup> Jamieson and Dobson, *Lancet*, 1907, vol. i., p. 1137.

## ARTIFICIAL PNEUMOTHORAX IN PULMONARY TUBERCULOSIS.

By JAMES CROCKET, M.D., Edin., D.P.H., Lecturer on Tuberculosis, University of Glasgow, Medical Superintendent, Consumption Sanatoria of Scotland, Bridge of Weir.

THE difficulty of dealing with advanced and progressive tuberculosis of the lungs, led us nearly five years ago to resort to artificial pneumothorax treatment. During that period we have employed it on eighty patients. A record of the successes and of the failures, as well as of the difficulties and dangers we have experienced, may be of interest and value to others.

The patients on whom the treatment was employed were practically without exception in a hopeless condition; several were apparently within a very short period of death. The results obtained may be classified as: successful, twelve; partially successful, thirty; failures, thirty-eight.

**A. The Successful Cases**, twelve in number, are those in which the patient from being extremely ill became very well. The temperature, previously intermittent or remittent, became normal; the cough and spit entirely ceased; weight increased, and working capacity was, to a fair degree at least, restored.

Enumeration of all the clinical facts relative to the individual patients would be interesting, but would occupy too much space. The following brief statements regarding them indicate generally the effects produced:—

**CASE I.**—A male patient admitted extremely weak and going downhill persistently. Artificial pneumothorax was induced after he had been in residence three months. A satisfactory result showed itself after the sixth injection. Temperature settled, weight increased, and sputum ceased, and progress has been uninterrupted since. For over three and a half years he has not been troubled with cough or spit. For two years he has been at his usual work. He has had 36 injections of from 200 to 1200 c.c.'s. Refills have been required every six or eight weeks.

**CASE II.**—A female patient whose illness dated to her last pregnancy. Her condition was very serious. Artificial pneumothorax was induced on the fifth attempt, and repeated for four months. There was a serious effusion then into the pleura. This kept up the



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pressure. The induction was therefore stopped. She has since kept very well, and for over two years has been doing full duties at home. She has no cough or spit. She had seven injections altogether. For the past two years she has had no treatment whatever.

CASE III.—A female patient who for months had hæmoptysis. Every day there was blood in the sputum. No measures were effectual in checking it. Her temperature was not good, and her general condition very poor. Pneumothorax was induced. As a result the colour stopped, the temperature became normal, the cough ceased. She has been at home doing very well for two and a half years. She had five injections of from 400 to 1400 c.c.'s during a period of five months.

CASE IV.—A female patient who had been under treatment for a year and did not make progress. Artificial pneumothorax was induced in April, 1916. Twenty-four reinjections of gas from 200 to 1000 c.c.'s were made during the following fifteen months. She has had no cough or spit, her temperature has been normal for the past two and a half years, and she has been doing full duty for the past two years. A serious effusion which she developed helped the compression.

CASE V.—A male patient who had repeated profuse hæmoptysis. He had also a cyclical temperature. Two injections were made on the side where the disease was active. This had the effect of checking the hæmorrhage, of stopping the cough, and of settling the temperature. He felt so well, that against the rules he went into a neighbouring village and returned intoxicated. For this he was discharged. He returned to see us a year afterwards to express his gratitude. In the interval he had been in the army, and kept perfectly well. We have heard from him since, and he is continuing to maintain his health.

CASE VI.—A female patient who had been in the Sanatorium for a year. Her general condition as well as the lung disease was very unsatisfactory. An induction was successfully made in June, 1916. This was kept up till September, 1917, when she was discharged. She returned to the Sanatorium to have refills, continuing to keep very well. She has had no treatment for a year, and has had no recurrence of symptoms.

CASE VII.—A female patient with advanced tuberculosis who had been in the Sanatorium previously for nearly a year, but refused artificial pneumothorax. She was discharged "not improved," and came back after a few months asking us to try to help her. Artificial pneumothorax was induced in February, 1917, and kept up for one year. For eight months of this period she had no cough or spit, her

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weight increased to beyond normal, and she was able for work. She has remained well since returning to her home.

CASE VIII.—A female patient who also had been in the Sanatorium previously. On discharge her condition was not satisfactory. The disease on the right side had become somewhat quiescent. On the left side, however, it was very active. We asked her to return to have the left side compressed. Our attempt to do so was successful. She was very much helped. Compression was maintained for fifteen months. Thirty injections were given, from 250 to 950 c.c.'s. She returned home a year ago, and has continued to keep well.

CASE IX.—A male patient. He had very advanced disease in both lungs, especially marked on the right side. The cough was so troublesome that he could not take food on account of vomiting excited thereby, and his sleep was greatly disturbed. By artificial pneumothorax the lung condition greatly improved, cough and spit entirely ceased, and his temperature became normal. An effusion occurred in this case too, which helped to maintain the pressure. Unfortunately, when apparently becoming strong and fit, he developed tuberculous ulceration of the intestines, and later cerebral tuberculosis, and died. For over a year prior to his death he had no recurrence however of lung symptoms.

CASE X.—A male patient of 49 years of age. He gave a history of long standing disease. Although several months in the Sanatorium he did not make any progress. We induced an artificial pneumothorax of the left side in March. Between that and November he had twelve refills. His cough and spit entirely ceased. He had mitral disease which almost proved fatal on one occasion. An effusion into the pleura of the affected side rendered further compression unnecessary. He has remained well for over a year, and is on full work.

CASE XI.—A female patient who was so ill that she was unable to sit up in bed. The cough made it impossible for her to take any food except in small quantities. She had a great deal of vomiting. We were asked to have her removed to an incurable hospital, but she was too ill to travel. We hesitated for long in attempting to induce a pneumothorax on account of her weakness. In May, 500 c.c. were successfully injected, and between that and December she had 14 refills. For three months after inducing a pneumothorax, she had to be kept on absolute rest. Seven months after beginning the treatment, she was able for light garden work and left the Sanatorium. We lost trace of her for nearly two years, and feared that she might have relapsed. She paid us a visit, however, recently, and told us that she had been

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quite well in the interval, and for all but three months she had been working in a factory.

CASE XII.—A female patient with advanced disease of the right side, infiltration at the hilum, and of the apex of the left side, cervical adenitis, tuberculous laryngitis and lupus erythematosus. An artificial pneumothorax was induced in June, 1917. Thirty-six refills have been given. Her temperature which was hectic in type became normal. She has no cough. The tuberculous laryngitis cleared up. The adenitis which was treated with radium much improved. She looks and feels very well, and for the past year has been able for light work.

**B. The Partially Successful** were thirty cases in number. By partially successful one implies that the patient was greatly helped. The temperature was improved, the general condition made much better, the cough and spit, if not stopped, much decreased. The working capacity, however, was not restored. All of those partially successful cases were very distinctly benefited by the treatment, although in several instances only temporarily. Although we have lost trace of a few, and six are known to be dead, the majority are alive and moderately well.

Space forbids us to enumerate the individual cases. The cause of the limited success may be classified as follows:—

- (1) Adhesions preventing complete collapse—nine cases.
- (2) Extensive disease in both lungs, leading to increased cyanosis and dyspnœa—five cases.
- (3) Bronchitis affecting the good lung and recurring from time to time when weather conditions were unfavourable—four cases.
- (4) Onset of influenza causing extension of the disease in the good lung—three cases.
- (5) Stopping the injections at too early a period, and reinductions being impossible on account of adhesions—two cases.
- (6) Patient refusing further injections, having had a fright by the onset of surgical emphysema—one case.

Four of the cases that are classified as partially successful are doing very well. I anticipate that they will eventually become arrested. Injections are being continued with them as well as several of the others.



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Apart from its curative value in certain cases, it is of great service symptomatically. It relieves pleuritic pain, it keeps the cough in check, it reduces the sense of fatigue, and, strange as it may seem, it frequently lessens the dyspnoea.

**C. Failures.**—These might be subdivided into those which were failures from the start, and those which proved failures eventually, although there was some encouragement at the beginning. The cases which were failures from the beginning were those with whom we were unable to do anything on account of adhesions. Generally three or four attempts at least were made before the effort was given up. In one or two instances 50 to 100 c.c. only could be injected, indicating that the gas was going into a small pocket of the pleura. The reason for such failures is quite familiar to those who do post-mortem examinations on tuberculous subjects, in which the visceral and parietal pleurae are frequently found so firmly adherent that the lungs cannot be removed from the cadaver without tearing the lung substance.

The cases which gave encouragement to begin with, but were ultimately unsuccessful, were those in which two, three, or four hundred c.c. of air or gas was got in on two or three occasions, but ultimately nothing could be done, and cases where eventually even a little extra pressure increased the cyanosis and dyspnoea of the patients, and they felt much worse as a result. About six or seven cases had to be stopped because of nervousness on the part of the patients, and several because they did not co-operate whole-heartedly.

Altogether nearly three thousand injections have been given to the various patients. As can be easily understood, we have had occasional difficulties, and one or two accidents. The chief among these were the following. I do not mention pleural effusion. That is not a difficulty or danger usually, but a help.

1. A patient who has done well and has since progressed very satisfactorily gave signs of collapse an hour after an injection. He had a great deal of pain in the side, became very cyanosed, and had a pulse of 140. His urine, previously normal, showed the diazo-reaction. The cause of this was the passing over into the pleural cavity of some hydrarg. perchlor. solution from the manometer tube. He was very ill for about a week. Eventually he became all right. This taught us to watch carefully the tube leading from the mano-

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meter, and to make sure that the filters were not wet at any time before or during the operation.

2. A patient for whom pneumothorax was induced to stop a hæmorrhage had 1450 c.c. injected. At the end of the operation she said that she felt quite well, and her pulse was satisfactory. On returning to the room about fifteen minutes later, she was seen to be cyanosed, the pulse could not be felt at the wrist, and her extremities were cold. It was surmised that the large injection of air as it became heated in the pleural cavity had expanded, and consequently exerted greater pressure on the heart than it could stand. A needle was rapidly thrust into the pleural cavity to remove the pressure. Fomentations were applied, stimulants were given, the end of the bed was raised, and she became quite all right. She is now well and has had no symptoms of the disease for two years.

3. A male patient during induction complained of a peculiar sensation behind the sternum. This became more severe, and he felt as if he were going to choke. The operation was at once stopped. Fomentations were applied. Stimulants were given hypodermically and by the mouth, and after about an hour and a half he came all right. It was surmised he had an air embolism. There were no after-effects, and he has continued to keep moderately well. On account of adhesions we were never able to secure complete collapse in this case.

4. A patient with advanced disease, on whom we hesitated very much to attempt anything, but who repeatedly asked us to give him a chance. On the first injection 400 c.c. was given; he was very short of breath after it. On the second occasion when an attempt was made, he brought up a few spits of blood, and for several days afterwards had cardiac asthma. He died about a fortnight later. There is little doubt the induction hastened the end in his case. Post-mortem examination showed extensive disease of both lungs. The five lobes were involved. He also had marked fatty degeneration of the heart. Our theory was that he got a gas embolism which localised itself in the lung tissue.

5. Another patient, a female, who was extremely ill, also showed cardiac asthma after compression. In this instance, however, the condition passed off. She is now very well. Although a little short of breath on exertion, she has been able to work for a considerable time. The cardiac asthma we thought was caused by undue pressure on the heart.

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6. A male patient after the fifth injection noticed that the face, neck, and chest-wall were blown out. They were crepitant to the touch. The injection of air had torn some adhesions, and caused this surgical emphysema. It caused no trouble, and cleared up in a few days. The patient, however, became alarmed as a result of it, and refused further injections. One other patient had surgical emphysema to a much less degree. We have another case at present which shows surgical emphysema to a slight degree.

7. A female patient the day after an injection suddenly became very ill. She had a sharp pain in the side, increased tympany, and marked dyspnoea. Later she had an effusion which reached up to the second rib. We surmised that, through the rupture of an adhesion, a spontaneous pneumothorax had been superadded to the artificial. She has recovered. The effusion was absorbed, and she is now fairly well, although not yet fit for normal work. We are again injecting air from time to time.

8. On 18th November 1918, we had a death as a direct result of the attempt to induce artificial pneumothorax. It was a case of advanced phthisis in a female who had been in the Sanatorium for about four months. As her condition was very unsatisfactory, artificial pneumothorax was advised. Complete collapse could not be obtained, but it was effectual in checking to some extent the cough, and certainly improved the temperature and general condition of the patient. Previously confined to bed, she became able to take a little walking exercise. In September she had an attack of influenza which interrupted the treatment. During it there occurred an extension of the disease in both lungs. The cough again became very troublesome. When the influenza settled we considered, yet doubted whether it was advisable, to attempt an induction again. Her dyspnoea was very marked, and she had a good deal of bronchitis. She asked us to try it, and the needle was inserted into the sixth interspace in the mid axillary line. It showed a positive pressure of 4 c.c. This almost immediately became negative and remained at minus 4 c.c. Just then she complained of feeling funny, and of having pain in her back. The needle was at once removed, and she said that she felt better. The pulse, however, became weak. A thirtieth of strychnine was immediately injected. The respirations almost at once ceased, she became rigid, the right leg twitched, the pupils dilated



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and ceased to respond to stimulation, they contracted and again dilated. Fomentations were applied, artificial respiration was resorted to. Nothing was of any avail. Death took place within four minutes. It is interesting to note that this, the only death which we have had, resulted not from the injection of any air or gas. We had got no further than the insertion of the needle. It was caused by the air in 8 cm. of  $\frac{1}{4}$ " glass tubing, being sucked into the lung by respiration. Post-mortem examination showed little air-bubbles in the superficial vessels of the brain, indicating that death had resulted from an air embolism. The five lobes of the lung were involved, and there was a cavity, the size of an orange in the right upper lobe, the walls of which were adherent to the thoracic parietes. We were able to make out the track of the needle into the lung.

To obviate the recurrence of such an accident, we now begin the operation by injecting oxygen with the supposition that if it be sucked into a blood-vessel inadvertently punctured, it will be more readily absorbed, and less likely to cause untoward effects. Experiment in fact has proved that the affinity of the blood for oxygen is such as to make it impossible to cause an embolism.

We also now use a needle with an extra stopcock at the branch where the rubber tubing fixes on to it. The needle is inserted with the stopcock off. When supposed to be in the pleural cavity it is turned on for a second. If the pressure is negative it is kept on. If not, it is immediately turned off again while further manipulations are made. Further we now begin with the pressure in the manometer negative, reasoning that if the needle be in a blood-vessel it will suck blood up into the tubing, and that will show in the glass tubing.

It is interesting to record the fact that although we told the other patients who were having pneumothorax treatment regarding this accident, and pointed out the risk each of them ran every time we made an injection, all with one exception asked us to continue with the treatment. Even those who had no likelihood of receiving permanent benefit felt that the sense of well-being which artificial pneumothorax had brought to them more than compensated the risk which they ran.

There is no doubt as to the value of pneumothorax for advanced cases of phthisis. It gives, as the facts of this paper show, a chance of health to many cases that are practically hopeless. It may give cure. There must always be a risk

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as one is working entirely in the dark, it being impossible definitely to make sure that adhesions are present or that one's needle has not entered the lung tissue.

To some the results obtained may appear at first sight to be disappointing, but the fact must be recalled that they were all hopeless cases at the beginning of the treatment. It must also be noted that thirty-five of the cases out of the thirty-eight which were failures are already dead; that eleven out of the twelve on whom it was successful are alive, well and working, and that some of those who have eventually proved successes were amongst the most severely ill. The results are really very encouraging.

Pollock, in his *Elements of Prognosis in Consumption*, 1865 (page 401), makes the statement: "Could we for a time stop the movements and suspend the peculiar functions of the lung which is the seat of the deposit, could we treat it as we do the external parts of the body by rest and remedies which relieve local congestion, we should have little difficulty in reducing tubercle of the lung to the inert condition of a gouty deposit of the joint."

This comparatively modern method of dealing with phthisis proves that he was right. Our partial successes have occurred when partial compression and immobilisation only would be achieved. Our failures occurred when on account of the disease, adhesions, or a bilateral condition, arrest of the movements and peculiar functions of the lung were impossible.

The value of artificial pneumothorax, of course, is greatly enhanced when one recalls the facts that it is generally resorted to when everything else has been tried, when nothing has proved successful, when everything is to be gained if one is successful, when nothing is to be lost if it be unsuccessful.

One certainly by no other therapeutic measures, dietetic hygienic or medicinal, can achieve success at all comparable in nature and degree with artificial pneumothorax. In fact this operation at times gives results more dramatic than anything I know of in Medicine or Surgery.

## OBITUARY

DAVID BERRY HART, M.D., F.R.C.P.E.

ON Monday afternoon, 14th June, what was mortal of David Berry Hart was committed to mother earth in the beautiful southern part of the Grange Cemetery. Many of his friends were there gathered together, and the President and other officials of the Royal College of Physicians attended. His death had taken place on the preceding Thursday (10th June), after an illness of a little over two weeks' duration; but he had not been feeling well during the winter, an attack of influenza being blamed for the weakness he experienced. Nevertheless, he lectured to his Summer Class in Surgeons' Hall with his usual attractiveness up to nearly the end of May.

Dr Hart was born in Edinburgh on 12th October 1851, and was therefore in his sixty-ninth year when death overtook him. He was the son of James Hart who was connected with the printing trade, and his mother's father was David Berry, the builder. He received his education in Edinburgh, and was distinguished as a student in the University by his originality of thought, and by his constant devotion to the clinical work of the wards of the Royal Infirmary. He graduated as M.B., C.M., in 1877, and after a short time on the Continent (in Vienna) he settled in practice in Edinburgh, having been appointed by Professor Alexander R. Simpson as his University and private assistant. It was not long before the young obstetrician and gynecologist showed the stuff that was in him by publishing researches on the structural anatomy of the female pelvic floor by the frozen sectional method, and he gathered these researches together in a thesis for the M.D. degree in 1880, which won for him not only the highly-coveted gold medal but also the Syme Surgical Fellowship. He also collaborated with Professor Simpson in the production of a plate which came to be classic, showing the effect of the genu-pectoral position upon the pelvic organs, and shortly afterwards (in 1880) he published his atlas on the structural anatomy of the female pelvic floor. Several results followed from these early investigations made by Dr Hart. One was the throwing of a flood of light upon the behaviour of the floor in various physiological conditions including labour; another was the explanation yielded of the true nature of so-called prolapsus uteri, now known





THE LATE DAVID BERRY HART, M.D., F.R.C.P.E.



## David Berry Hart

to be, as Hart named it, sacro-pubic hernia; another was the elucidation of the mode of action of the Sims speculum; and yet another was the rendering possible of the modern method of examining the bladder known as cystoscopy. Further, Hart's work by means of frozen sections stimulated others who followed him in Edinburgh to employ the same means to investigate the anatomy of labour, the puerperium, the foetus, the new-born infant, and the child. Hart, himself, extended his use of the method to the examination of other obstetrical problems, such as the anatomy of ectopic pregnancy and the mechanism of the third stage of labour. Almost every one of the twelve papers published by Dr Berry Hart in the years 1881-3 was important enough to have by itself established his reputation as an original investigator and thinker of the first rank. Further, at this time he was acting as one of the editors of the *Edinburgh Clinical and Pathological Journal*, and he was producing along with Dr Barbour the *Manual of Gynecology*, which was to pass through many editions, be translated into several foreign languages, and raise the fame of the Edinburgh School to a high level in the new speciality of scientific gynecology. Surely the early eighties of the past century were wonder-working years in Dr Berry Hart's remarkable career.

In 1884 clinical opportunities began to open out before Dr Hart, for in that year he was appointed Assistant Obstetric Physician to the Royal Maternity Hospital (becoming full Physician in 1889 and Consulting Obstetrician in 1915), and in 1886 he became Assistant Gynecologist to the Edinburgh Royal Infirmary (succeeding to the Gynecologistship of Ward 36 in 1901). Dr Hart had already begun to teach obstetrics and gynecology theoretically, first in the University under Professor Simpson, and after 1883 in the extra-mural school at Surgeons' Hall; but through the above-named appointments he was enabled to add clinical instruction in the same subjects. In both he was deservedly popular and successful, using his own methods in his own way, which was one in which questioning played a prominent part. His appeal was ever to the best and most thoughtful students of the year; thoroughness and depth were characteristic of all his work, and yet he prepared men well too for examinations, always presupposing that they were the best type of men. His hospital appointments (and to them that of Gynecologist to Leith Hospital must be added) gave him an opportunity for



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developing his powers as an operator, and he was the first in Scotland to perform successfully the operation of abdominal section for ruptured tubal pregnancy, and for advanced broad ligament gestation; but it has to be conceded that it was as an expert scientific investigator rather than as a brilliant surgeon that Berry Hart left his mark upon Edinburgh. On more than one occasion he sought a professorship in a Scottish university, and in one case it seemed as if it were within his grasp; but his usual success did not attend him here and he never filled a Chair of Midwifery.

Honours at home and from abroad came to Dr Hart in full measure. In 1890 he was elected President of the Edinburgh Obstetrical Society, having been Vice-President in 1887; in 1892 he had the honour of opening the discussion upon "placenta prævia" at the International Medical Congress at Brussels, and on three occasions he was asked to initiate debates upon obstetrical and gynecological subjects at annual meetings of the British Medical Association; in 1899 he was made an Honorary Fellow of the American Gynecological Society, the same compliment was paid him by the Berlin Obstetrical Society, and he became a Corresponding Fellow of the Leipzig Obstetrical Society; and he was chosen to act as additional Examiner in Midwifery and Gynecology in the Universities of Edinburgh, Oxford, Birmingham, and Liverpool. He had become a Fellow of the Royal College of Physicians of Edinburgh, and during the last years of his life he acted as Librarian to that College, in which also he was one of the Examiners for the Licence and the Membership; just two years before his death he was awarded the Victoria Jubilee Cullen Prize "for the greatest benefit done to practical medicine," another gift from his College; and for many years he was a Fellow of the Royal Society of Edinburgh.

Meanwhile, Dr Berry Hart's fertile mind was ever busy with the great problems of the time, not only in his own speciality but also in the larger sphere of biology and embryology. One has only to name the third stage of labour and the separation of the placenta, extra-peritoneal ectopic pregnancy, the nomenclature of obstetric presentations and positions, the nature of the tuberoso fleshy mole, the development of the urino-genital tract, the hymen, and the amnion and cord, and the descent of the testes and ovaries, to bring to mind impressive additions to our knowledge of these subjects all from Dr Hart's pen. In the

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later years of his life he welcomed Mendelism and all its mathematical subtleties with an enthusiasm which was very real and yet a little inexplicable; and he applied its principles with wonderful cleverness and persistency in the elucidation of the mysteries of teratology, of twin births (including his favourite subject, the enigmatic "free-martin"), of hermaphroditism, and of differentiation of sex. Many of these contributions were in the form of papers read before the Edinburgh Obstetrical Society, and they were always provocative of animated discussions, for they invariably contained novel views presented with all Dr Hart's genius, and supported by his powerful advocacy. He was a giant in debate and his criticisms were both penetrating and incisive, so much so that the tyro in obstetrical discussions occasionally felt aggrieved and perhaps hurt; but if such hurt persisted for the night the next day saw Dr Hart laying all his knowledge of the subject freely at the service of the writer of the paper he had dealt so trenchantly with. Indeed, to have a contribution pungently criticised by Hart was to receive from him a recognition that the paper was of unusual merit. He sat sadly silent in the presence of poor work; and he set a high standard for himself and accepted fair criticism cheerfully. He was one of the ablest of the able men who meet round the table of the Pathological Club, and there his speeches gave interest to all subjects in the wide range of medicine.

As a companion, and especially as a conversationalist, Dr Berry Hart was entertaining and stimulating. He was never conventional in a subject about which diverse opinions were possible, and out of a well-stocked mind, the product of years of omnivorous reading, he could bring out things old and new with telling, sometimes with dramatic, effect. These powers were well known to his friends, but they remained unrecognised by the wider circle of his acquaintances till the publication of his work on *Some Phases of Evolution and Heredity* in 1910. In this brilliantly clever book Dr Hart gave the rein to his fancy; and bringing together a knowledge of out-of-the-way subjects, a common-sense vision of modern problems, a critical apparatus equipped with delicious humour and sly satire, and a cheery, healthful hopefulness, he presented his readers with an intellectual treat which they enjoyed to the full. And yet the book contained lessons about and indicated dangers in many popular views and speculations, which gave it a value far above that of the ephemeral although fascinating *jeux d'esprit* of

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other writers on the same subjects. In a few pregnant words Dr Hart showed the foolishness of some things which were being said, the subtle danger of some sorts of propaganda, and the inherent weakness of certain lines of argument; and many of his conclusions have attained to the dignity of epigrams. One can well imagine that he heartily enjoyed the writing of this book, and that he threw it down before the reading public with feelings similar to those of Thomas Carlyle when he finished *Sartor Resartus*; and yet, let it not be forgotten, there were in it, as in *Sartor*, great truths strongly enforced on every page, and a deep seriousness underlay all the banter.

The most important work of Dr Berry Hart's later years was his *Guide to Midwifery*. In this book, as in so many other accomplishments, he broke away sharply from convention, and he sketched out a plan for teaching midwifery which is quite his own. He taught (and his teaching was reflected in the *Guide*) his students always with the aim of helping them to teach themselves: he gave them information about the way to a good, rational, working knowledge of obstetrics, applicable in all emergencies and at all times; and he expected them to think out things for themselves. In a word, he employed post-graduate methods with undergraduates, and whilst he thus limited the number of men attending his teaching, he ensured that they were of a thoughtful type. All these characters were reflected in his *Guide to Midwifery*, a book which the passing of the years will prove to have been drawn up on the right lines.

Dr Berry Hart was perhaps at his best in his Museum in Surgeons' Hall. He was there surrounded with the actual specimens upon which he had worked (and he worked always with contagious enthusiasm), and from which he had drawn out lessons which led him to the views he was so resolute in defending. He handled these specimens with pride, and was ever ready to explain their meaning to the interested visitor. Without him the Museum is, of course, shorn of much of its value; but it is to be hoped that its contents will be preserved for the use of the students who in the future will be studying there. Naturally enough he spent much money upon the Museum, but he gave even more freely of his time and so conferred an added importance on every specimen.

No sketch of his life could be complete without a reference to his practice. At one time he had a large general practice,



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which was followed by a very good special one in obstetrics and gynecology; and he had the happy knack of endearing himself to his patients who, whilst they admired his profound knowledge, were even more impressed by the practical nature of all his treatment and by the absence of anything like side or parade of powers. In this way he won their respect, their confidence, and their affection.

Outside his professional life he was interested in all the really great movements of his time. He was a Liberal in politics, and he was attached to the United Free Church of Scotland, being a faithful elder in St George's, Edinburgh. Like many another Scotsman he followed a sermon with an intelligent alertness which, without neglecting the emotional side of such an exercise, sought to explore the whole range of the preacher's equipment of thought and was not afraid to express an individual opinion. Yet his faith was in its essence a simple one. He had another Scottish characteristic, an intense love of his home and of its inmates, and the sympathy of all who knew him in this hallowed relationship will be given unstintedly to his widow and to his sons and daughters in their time of bereavement.

J. W. B.

We are indebted to Mr ALFRED DANIELL, M.A., LL.B., D.Sc., Advocate and Barrister-at-Law, for an additional appreciation of Dr Berry Hart:—

I am very much touched by the request of the editors of the *Edinburgh Medical Journal* that I should contribute an appreciation of my late friend David Berry Hart as a man and as a scholar. I am glad of the opportunity offered me, though I feel I cannot do full justice to the subject. And it is perhaps even the less easy to do so in that I was honoured with his abiding friendship ever since his early days as a student in Lister's wards, in the old Infirmary, and that the world can never seem the same place to me in his absence.

From the beginning he had a circle of friends who appreciated most warmly his brotherliness and kindly helpfulness and his brightness and breadth of mental outlook. Proud were we, in days now long past, when he began his career of research and at once threw light upon matters which had seemed obscure, and immediately obtained recognition by the verdict of what Bacon calls "contemporary posterity." We were more elated that he himself was by the astonishment of the American

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visitors to this country on finding that the well-known Berry Hart was so young a man, or by the Germans declaring that another Simpson now walked the streets of Edinburgh. These things did not elate him at all; they simply encouraged him to go on with his work, and with his work he went on.

I am under the impression that the work thus done in his earlier years has been the key to and the foundation of all that has followed. And this must be so with any truly scientific man. Newton spent years of labour in working out and developing an elementary though illuminating generalisation. The method of science is first to get facts, then to ponder over them and see what conclusion suggests itself, and then to follow this up by seeing what light this conclusion can throw upon other problems which present themselves. It may be that the conclusion will not hold water in view of the further problems which it has suggested; the facts connected with these further problems may tell against it; in which case the conclusion is held to be inadmissible, and candour demands that it be thrown aside. Collateral problems also come up and lend variety to the occupation; some of these may be followed far; but the whole makes up a life-work, through which there runs the golden thread of persistent effort and sustained interest.

I do not presume to form an opinion as to the theoretical or practical value of my friend's life-work in research; that is for others to appraise; I only know the spirit in which he attacked it and unweariedly carried it on. An intense thirst for more light on the subject in hand sustained his efforts; he sought diligently for facts, more facts, and ever more facts. Some of his problems led him into mathematical regions, and he had no hesitation in invoking the aid of friends who had been through the mathematical mill. This involved writing out for him the results of probably unwritten chapters of mathematics; but he was not content merely to accept any results put before him; he qualified himself for understanding and appreciating the answers offered him by throwing himself heartily into the study of such things as the Differential Calculus, the Integral Calculus, the Theory of Probabilities, and the like, so as to be able to judge for himself whether the light offered him really illuminated his subject. He spared no pains in order to keep on the path that would lead to true knowledge; and if at any time he found that he was on a false track, he had no hesitation in saying so and retracing his steps till he got into the right path again.

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In all this he always seemed to me to feel that in exploring the paths which might lead to true knowledge he was doing work appointed him on earth ; and this he did "as in the Great Taskmaster's eye" ; this and the care of his patients, whom he had ever at heart.

His life-work and the contemporary progress of medical science, which he diligently followed, were not his only intellectual interests. He kept his mind fresh by riding various unrelated hobbies. Anything about Bismarck, the French Revolution and Napoleon, military history, had a fascination for him, and he pounced upon it, devoured it, and assimilated it, so that he was an encyclopædia of information on out-of-the-way aspects of these subjects and of many others, including physics, philosophy, and a wide range of general literature both British and foreign. He was therefore most interesting to talk with ; and he had withal a keen interest in all things and persons surrounding him, which remained fresh and alert to the last.

In fact, he never grew old ; the Berry Hart of the later years was, though ripened, in all essentials exactly the same person as the young Berry Hart of Lister's wards, keen, bright, and interested, and above all men brotherly, sympathetic, and helpful. Children loved him ; and he loved children. His patients became life-long friends, they and their children after them.

It is not for me to speak of his beautiful home relations ; "*il n'y a rien à comparer à la famille Berry Hart*" was the verdict of a French lady visiting this country, in conversation with me. He seemed like a delightfully sympathetic elder brother in the house, full of kindness and common sense, tempered by a bright sense of humour, with a cheerful and tranquil elevation of character which commanded respect and devotion as well as deep affection ; and withal there was irradiated an atmosphere around him of calm and simple broad-minded faith in the ultimate good outcome of all things.

His friends knew him as a thoroughly good man in the best senses of the term ; and though he has gone before, there will be many of us who cannot conceive of him in his new surroundings otherwise than as keenly interested in all that has opened to his vision, and perhaps as already having found something to exercise his indomitably inquiring spirit upon, as well as new opportunities of applying the unselfish helpfulness which characterised him when among us.



# CRITICAL REVIEW

## THE INTRAOCULAR PRESSURE.

By E. H. CAMERON, M.B., F.R.C.S.E.

EVER since Mackenzie, in the year 1830, observed that the eyeball became hard in cases of glaucoma, the question of the intraocular pressure has occupied the attention of a very large number of ophthalmologists, and an immense amount of work has been done in connection with the subject in all its bearings. In spite of this there are very few points about it that can be regarded as finally settled.

The eyeball may be regarded as a hollow capsule with more or less elastic walls, filled with fluid that enters it through certain channels and leaves it through others. This capsule is divided into two compartments by the lens with its suspensory ligament. It is generally held that a uniform fluid pressure exists in the interior of the eye, there being no difference between the pressure in the posterior compartment which contains the vitreous humour, and that in the anterior which contains the aqueous. Fluid can pass freely between the fibres of the suspensory ligament of the lens from the one compartment to the other. The iris divides the anterior compartment into two portions, the anterior and posterior chambers, which communicate with each other through the pupil.

The only fluid that enters the eye is the blood, and it does so by the ciliary arteries, anterior and posterior, and by the central artery of the retina. It leaves the eye through the anterior ciliary veins, the central vein of the retina, and the vortex veins, four or more in number, which pierce the sclerotic near the equator of the globe.

With regard to the lymph flow, there are many points that have still to be explained or proved, but it is the generally accepted view that there are no true lymph-vessels in the eye, and that the place of lymph is taken by the aqueous humour, a saline solution containing only about .025 per cent. of albumin. This fluid is secreted by the ciliary body, permeates the tissue of the vitreous, bathes the lens and fills the anterior chamber. It is a secretion and not a mere transudation of fluid from the blood-vessels. It is formed at a definite rate, serves to nourish the cornea, the lens, and the vitreous—the non-vascular tissues of the eye—and to remove waste products from them. It leaves the eye through the angle of the anterior chamber. This angle, often called the *filtration angle*, is formed by the attachment of the ciliary body and root of the iris to the sclerotic at the periphery of the anterior chamber. It is bridged across by loose lamellæ of connective tissue, the *ligamentum pectinatum*, which form the inner

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boundary of a fine circular canal which lies in the sclerotic at the point of its junction with the cornea, the canal of Schlemm. This canal is in communication with the veins of the sclerotic, but does not, under normal circumstances, contain blood corpuscles. The aqueous drains into the canal between the fibres of the pectinate ligament, and from it passes into the scleral veins and thus leaves the eye. It is held by most observers that the canal is in direct communication with the anterior chamber, but others think that it has a definite endothelial lining of its own.

A spur of scleral tissue lies between the pectinate ligament anteriorly and some fibres of the ciliary muscle posteriorly. It has been suggested that a contraction of these fibres may pull back the spur and open the canal of Schlemm widely. As soon as the muscular contraction ceases, the pectinate ligament by virtue of its elasticity, will draw the spur back into position and so close the canal. This pump-like mechanism draws the aqueous humour from the anterior chamber into the canal, and then sweeps it from the canal into the neighbouring veins. It has yet to be shown, however, that the circulation of the aqueous is interfered with by paralysis of the ciliary muscle.

It cannot be taken as proved that the ciliary body alone secretes the aqueous humour. The iris may take part in both secretion and absorption, but nothing is definitely known about the part that it plays.

The only other path, excepting the angle by which the aqueous might leave the eye, is by a lymph channel in connection with the optic nerve. It has been well established that in man elimination does not take place by this route to any extent, but that it does so in certain animals, particularly the rabbit.

The facts with regard to the secretion and circulation of the aqueous have been learned from a large number of experiments, many of which are now classical. The injection into the blood-stream of fluorescein and subsequent examination of the aqueous may be instanced; or the injection of Indian or Chinese ink into the eye in order to ascertain the directions of the movements of the injected particles by microscopic study of the excised eye.

Most ophthalmologists are agreed that the aqueous is slowly formed, and that it leaves the eye by means of the filtration angle, but some hold that little or no secretion or absorption takes place, and that if the aqueous leaves the eye, it does so via the blood-vessels of the iris and not by the angle.

The functions and vitality of the delicate nerve-tissues in the interior of the eye are very soon adversely affected by a rise in the intraocular pressure. It is consequently of great importance to the ophthalmic surgeon that he should have at his disposal some means

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of measuring definitely its amount. By palpation with the fingertips only comparatively large variations of pressure can be detected, and the most experienced observer is liable to make wide errors if he depends on this alone. Two other methods are open to him, manometry and tonometry, but only the latter can be used clinically. In the former, a canula connected with a manometer is inserted into either the vitreous or the anterior chamber, and the amount of the intraocular pressure in mm. of Hg thus ascertained. The tonometer, on the other hand, is an instrument which measures the depth of the depression produced by a weighted plunger placed upon the surface of the cornea. The upper end of the plunger actuates a lever which indicates upon a graduated scale the degree of dimpling caused, and the instrument is so constructed that the reading obtained from the scale can be interpreted in mm. of Hg. By manometry the intraocular pressure is measured directly, whereas by tonometry it is merely inferred from the degree of impressibility of the ocular coats. The higher the pressure, the smaller will be the depth of the depression produced by a given weight. By these methods it has been learned that the normal intraocular pressure is in the neighbourhood of 25 mm. Hg.

The original source of the intraocular pressure must be the blood-pressure, and it is obvious that the pressure cannot be greater than the blood-pressure in the smallest capillary in the interior of the eye. Otherwise blood would not be able to enter these tiny vessels. It is forced into the eyeball by each systole of the heart against the resistance of the elastic capsule of the globe, and a slight rise in the intraocular pressure, equal to about 2 mm. Hg, takes place synchronously with each systolic entry of the blood. This rise can be demonstrated by means of the tonometer, the indicator of which makes visible oscillations in time with the beats of the pulse. Division or ligature of the arteries entering the eye causes at once a fall in the intraocular pressure, while ligature of the vortex and anterior ciliary veins leads at once to a marked rise.

Under normal circumstances the pressure in the eye is maintained at a more or less constant level, and the volume of the intraocular fluids does not vary in amount. The entry of blood into the eye is balanced by the outflow of a corresponding amount of venous blood and perhaps aqueous as well. A rise in the amount of the general blood-pressure is followed by a rise of intraocular pressure, but even although the blood-pressure remains permanently heightened the intraocular pressure returns before long to the original amount. In diseases characterised by a high blood-pressure, for instance arterio-sclerosis, it is by no means the rule that the intraocular pressure is above normal. Experimental attempts to produce a permanent increase in



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its amount by raising the blood-pressure have failed, but on the other hand, it must be admitted that eyes in which marked degeneration of the blood-vessels is present are very liable to become glaucomatous. No rise in the amount of the intraocular pressure can be produced by obstruction of the venous outflow unless the exit veins themselves are ligatured close to the globe.

The intraocular pressure responds much more readily to a reduction in the amount of the general blood-pressure. It is easier to cause a fall of pressure in the eye by lowering the blood-pressure than to produce an increase by raising the blood-pressure. This fact seems to point to the existence in the eye of some mechanism which protects it from the evil effects of a rise of pressure, but how this hypothetical regulating mechanism acts is uncertain. It may produce its effects by means of the vasomotor nerves, the vascular coat of the eye, the uveal tract, behaving like erectile tissue and constituting a blood reservoir. Nerve-cells of the sympathetic type, grouped into masses and forming ganglia, have been described in the uveal tissue, and are, in the opinion of some observers, instrumental in regulating the amount of its blood content. It has been shown experimentally that stimulation of the sympathetic fibres running to the eye, which convey vasoconstrictor impulses, causes a fall of intraocular pressure, while stimulation of the trigeminal, by which vasodilator impulses are conveyed, is accompanied by a rise.

The constant secretion and absorption of the aqueous has suggested the possibility that it may play a part in regulating the intraocular pressure. A rise of pressure may be compensated for by diminished secretion or increased elimination of the aqueous, and a fall by increased secretion or diminished absorption. These facts have still to be proved, but certainly experimental occlusion of the angle of the anterior chamber has caused a rise of pressure.

The behaviour of the retinal artery and vein under varying conditions of intraocular pressure has thrown a good deal of light upon the question of the relation between the blood-pressure and the intraocular pressure. As a rule no pulsation is visible in the artery unless the intraocular pressure is above normal. If the pressure is raised, visible pulsation of the artery will commence when the intraocular pressure becomes greater than the diastolic pressure in the artery. This is regularly seen in cases of glaucoma. The vessel will be emptied of blood except when the blood-pressure is raised by the cardiac systole. Bailliant has recently devised a small spring dynamometer by means of which he makes a definite and increasing pressure upon the exterior of the eye. At the same time he observes the retinal artery with an electric ophthalmoscope and notes the degree of pressure required to induce pulsation. The pressure is then further

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increased until the entry of blood into the artery is prevented and a second reading of the dynamometer pressure is then made. The first reading indicates the diastolic pressure in the artery and the second the systolic. A tonometer is then placed upon the eye and pressure again made with the dynamometer to the amounts already found necessary to balance the diastolic and systolic pressures. The reading of the tonometer with each of these two pressures indicates the amount of the diastolic and of the systolic pressure in the artery in mm. of Hg. The results obtained appear to show that the pressures are 25 and 50 mm. respectively. It is taken for granted that the tonometer can measure the amount of the intraocular exactly in mm. of Hg, but this it cannot be depended upon to do. The author of the method advises his readers against attaching too precise a value to his figures. He does not report any ill-effects from his experiments, but to interfere in such a manner with the blood-supply of so delicate a tissue as the retina seems a procedure that can hardly be considered safe. Experiments in rabbits, carried out by means of an injection manometer, have yielded different results. An intraocular pressure of at least 90 mm. Hg was found to be necessary in order to induce pulsation, and of about 10 mm. more to overcome the systolic pressure in the artery. The general opinion is that the entrance pressure in the central artery of the retina is about 95 mm. Hg, and that the pressure in the intraocular capillaries in a healthy eye with a pressure of 25 mm. is probably about 45 mm.

Visible pulsation in the central vein is often present in normal eyes. In many others it can be readily induced by a light pressure with the finger. In glaucomatous eyes it is sometimes present and sometimes not. It is likely that the pressure in the central vein is somewhat higher than the pressure in the chambers of the eye, but that the difference between the two pressures is small.

A factor in connection with the intraocular pressure about which there is great uncertainty is the degree of elasticity of the cornea and sclerotic. Were the capsule of the eyeball absolutely rigid, little or no increase of the inflow of fluid would be possible unless balanced by a corresponding outflow. By how much the yielding of the coats of the eye can compensate for an increase in the volume of the intraocular contents is uncertain. In an adult suffering from glaucoma we do not observe much change in the shape of the globe, and it has been shown by experiment that when the pressure is raised from 19 to 70 mm. Hg the cubic capacity of the globe is increased by only .007 of its original amount. In children the coats of the eye are much less resistant, and in them a great increase in the size of the globe takes place when it is subjected to a prolonged increase of pressure.

The importance of the question is rendered greater by the fact that

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the surgeon, in endeavouring to estimate the ocular pressure clinically, can only infer its amount from the degree of the tension of the coats of the eye as appreciated by either his fingers or the tonometer. In dealing with cases he is in the habit of speaking of the intraocular tension rather than of pressure. It is obvious that he may be misled by an increase in the rigidity of the sclera, as this is not necessarily accompanied by a rise of pressure inside the eye. This has been shown by experiments upon excised pigs' eyes, tonometric readings from which were taken under three conditions: first, immediately after removal from a pig recently killed; again, after immersion of the eyes for several hours in a solution of formalin in normal saline; and again, after a much longer period of immersion in the same solution. Under all three conditions the manometric pressure was found to be 25 mm. Hg, but the tonometer readings were 22.5, 30, and 61 mm.

Tonometry has been in general use clinically in this country for rather more than ten years, the instrument employed by most surgeons being that devised by Schiötz of Christiania. In constructing his instrument he tested eight excised human eyes under eleven different degrees of pressure. A known pressure was first established in the eye by means of an injection manometer; the tube connecting the manometer with the eye was then closed and the tonometer applied. In this way he obtained a tonometric reading corresponding with each variation of internal pressure. The same readings were not given by all the eyes, possibly on account of variations in the elasticity of their coats, or of differences in their corneal curvatures, and the instrument was finally graduated on an average of all the results. Hence it cannot be expected to estimate the intraocular pressure exactly in mm. of Hg, and Schiötz does not claim that it can do so. His experiments were made upon excised eyes and his results therefore cannot, strictly speaking, be exactly applied to living eyes *in situ*. Apart from the question of post-mortem changes, it is possible that the orbital tissues may give support to the sclera and influence tonometric readings accordingly. When the tonometer is applied to glaucomatous eyes it must be remembered also that such eyes have been profoundly altered by pathological processes and cannot be compared exactly with excised eyes in which a rise of pressure has been produced artificially.

Further attempts have been made of late to obtain more exact readings by tonometry. Experiments carried out upon the same lines as those of Schiötz, but upon dead human eyes *in situ*, in the post-mortem room, have shown that the Schiötz instrument rather underestimates the amount of the pressure. M'Lean has gone further, as he obtained permission to test with a manometer four living eyes that were about to be excised for incurable glaucoma. His experiments



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appear to have been carefully and accurately conducted, and even greater discrepancies between the readings of the manometer and those of the Schiötz tonometer were found. He had previously constructed an improved tonometer which he tested on living cats by means of an injection manometer, and he claims that his own instrument is more accurate than that of Schiötz. In his experiments on the living human eye general anæsthesia was induced by ether, and a canula with a bore of 2 mm., connected with a manometer, was passed into the vitreous cavity. Tonometric readings were then made, in the first two cases by means of the Schiötz instrument only, and in the last two by means of his own instrument as well. The results of all his experiments tend to show that the former gives too low a reading of the pressure. Also, its readings of variations of pressure in a given eye were not proportionate to those of the manometer. The readings of the new instrument coincided much more nearly with those of the manometer.

If M'Lean's contentions are correct, the value of a great deal of the experimental work that has been carried out by means of the Schiötz tonometer may be considerably lessened; his instrument is, however, still under trial. Whatever be the defects of the former as a piece of accurate scientific apparatus, there is no doubt that it has proved itself to be of great value clinically. Its margin of error is much less wide than that of palpation, and it may be depended upon to indicate a difference of tension between the two eyes in the same individual, or variations in tension in the same eye from time to time. It is thus of great help to the surgeon, both in diagnosis and in judgment of the course of a case.

REFERENCES.—<sup>1</sup> Roemer, *Textbook of Ophthalmology* 1912. <sup>2</sup> Elliot, *Glaucoma*, 1917. <sup>3</sup> Magitot, *Annales d'Oculistique*, 1917. <sup>4</sup> Bailliant, *Ibid.*, 1917. <sup>5</sup> Priestley Smith, *British Journal of Ophthalmology*, 1918, 1919. <sup>6</sup> M'Lean, *Ibid.*, 1919.

## NEW BOOKS

*A Manual of Venereal Diseases for Students.* By L. W. HARRISON.  
Pp. xv. + 360, with 85 illustrations. London: Henry Frowde  
and Hodder & Stoughton. 1920. Price 16s. net.

The name of Colonel Harrison on the title-page of this new work on Venereal Disease is a sufficient guarantee of the authoritative nature of its contents, and we welcome at this particular moment what may be looked upon as an official statement of the present-day position of the clinical aspects of the venereal problem. The probationary stage of the arsenical method of treatment in syphilis may now be said to be over, the Wassermann reaction has been sufficiently tested to admit of an estimate being formed of its diagnostic value, and the clinical experience of the new school of venereal specialists on such questions as preventive and abortive methods of treatment has now accumulated to such proportions that definite opinions can be formulated. No one is better qualified to reflect these opinions than Colonel Harrison, and the work before us may be accepted as the most advanced statement of the situation.

Each of the diseases included in the venereal group is thoroughly described in all its bearings, and special attention is devoted to the consideration of diagnostic measures and the details of treatment. The sections dealing with the arsenical compounds in the treatment of syphilis are particularly illuminating, and will prove useful to the practitioner no less than to the student. The coloured plates, of which there are sixteen, give a clear impression of various clinical appearances, and the other illustrations are equally satisfactory.

If we have any adverse criticism to offer it is only on the arrangement of the subject matter, which does not appear to be well adapted to giving the student a consecutive picture of the different forms of venereal disease. The separation of the chapters on the clinical aspects of gonorrhea from those on the treatment of the same disease by about 170 pages, for example, seems undesirable and unnecessary. This, however, is a very minor fault. We confidently recommend this book to practitioners and students as an authoritative and practical exposition of a most important subject.

*Colloids in Biology and Medicine.* By Prof. M. BECHHOLD, translated from the second German edition by J. G. M. BULLOWA, A.B., M.D. Pp. xiv + 464, with 54 illustrations. New York: D. Van Nostrand Company. 1919. 31s. 6d. net.

In the light of recent discoveries many of the so-called "Vital" phenomena have lost their mystery and can be readily explained as simple colloid processes. This emphasises the importance of obtaining a wider knowledge of the properties and reactions of colloids.

## New Books

The first part of the present volume is highly technical, and is devoted to an account of the more essential parts of colloidal chemistry and of the processes employed in colloid research. Considerable stress is laid upon the importance of *Ultrafiltration*—a method of investigation introduced and elaborated by the author. A series of ultrafilters can be easily made by impregnating various fabrics with gelatinous colloids of different concentrations. By use of these an idea of the size of colloid particles can be obtained, and mixtures of colloids and crystalloids, etc., can be separated more quickly than by dialysis and without the dilution involved in that process. Such ultrafilters can separate particles much finer than those dealt with by other means, and it is possible that their use may lead to the discovery of some poisons at present labelled *filter passers*. Colloidal chemistry is of assistance in many branches of medicine and in Part II. several of its applications are discussed, including such varied subjects as Cooking, Immunity, and Enzyme action.

In Part III. the influence of colloid activity in human physiology is reviewed, and the subjects of Metabolism, Secretion, and Excretion are dealt with.

Part IV. is devoted to a consideration of the action of various drugs and chemicals on the colloids of the body, and special mention is made of the recently introduced colloidal therapeutic agents. A chapter on the colloidal aspect of microscopical technique is added, and the volume finishes with a full list of references. While the author appeals to a wide public of biologists and practical physicians, his work will be most appreciated by those engaged in medical research.

*Functional Nerve Disease: An Epitome of War Experience for the Practitioner.* Edited by H. Crichton Miller, M.A., M.D.  
Pp. xi + 208. London: Henry Frowde and Hodder & Stoughton. 1920. Price 8s. 6d.

A useful summary of the chief views held in this country regarding the war psychoses. The papers are written by doctors who were attached to the various hospitals dealing with shell-shock and similar cases. Thus besides papers by Dr Crichton Miller himself, we have papers by Drs Edwin Bramwell, Rivers, W. H. Bryce, and others who were working in Scotland during the war. Attempt is made to discriminate between neuroses of physical and of psychogenetic origin. Dr William M'Dougall supplies a useful summary of the different papers, which, for the rest, are characterised by common-sense handling and avoidance of too long words. We note that on the whole Freud has been more or less "repressed," and in this we find no great cause for complaint.



## New Books

*Psychology from the Standpoint of a Behaviorist.* By JOHN B. WATSON, Professor of Psychology, The Johns Hopkins University. Pp. ix+429, with 65 illustrations. Philadelphia and London: J. B. Lippincott Company. 1919. Price 10s. 6d. net.

This book opens with a detailed and well-illustrated description of the nervous system, muscles, and glands, but the author himself states that these "parts of the book can be omitted without injuring the continuity of the text," which deals with psychology. "Behavior psychology," we are told, is "purely an American production," which aims at helping us "to throw off the shackles of the present-day conventional psychology and teaches us to face the human being as he is." There is a good deal of padding in this book, but also a fair amount of common sense. The author gets along quite well without the use of such conceptions as "the self" or "the unconscious."

*Industrial Medicine and Surgery.* By HENRY E. MOCK, B.S., M.D., F.A.C.S., Assistant Professor of Industrial Medicine and Surgery at Rush Medical College. Pp. 846, with 210 illustrations. London: W. B. Saunders Company, Ltd. 1919. Price 42s. net.

In the U.S.A. there is no national or state system of Health or of Unemployment Insurance, nor is there a system of Factory and Workshop legislation comparable to our own. There is no general Public Health legislation applicable to the whole country, nor have Local Authorities in our sense of this term been endowed with the general powers contained in our Public Health Acts. The growth of great cities and the stress of industrialism have, however, compelled action to be taken. The result is that the larger industrial corporations or combinations of smaller ones have found it to their interest, especially monetary, to employ a considerable staff of medical and surgical (and in some cases even a specialist medical staff), as well as a specially trained nursing staff to supervise the individual and social health of their employees. The sociological side of their work is in this country largely overtaken by the Nurse Health Visitor and by nurses under the Tuberculosis and Maternity and Child Welfare services of our Public Health Authorities. How this work has developed in America, and how it should be carried on is described in an able and informing manner by Prof. Mock. The work deals very fully with the relation of medicine, using the word in its widest sense, to Industrialism. It is written in an interesting and at times refreshingly "American" style, and though it will appeal most to those familiar with American conditions, it should prove of much interest to medical men and others concerned with the welfare of industrial workers in

## New Books

this country. It is well printed on good paper, and is profusely and appropriately illustrated. A very full bibliography on Industrial Medicine and Surgery and an index completes the volume.

*Diseases of the Nose, Throat, and Ear.* By W. SMITH SYME. Pp. 322, with 26 illustrations. Edinburgh: E. & S. Livingstone. 1920. Price 9s.

To give an adequate account of our present-day knowledge of oto-laryngology in a handbook of 300 odd pages is no easy task. Nevertheless the author has succeeded in placing at our disposal a compendium in which even such recent introductions as suspension laryngoscopy and intranasal operation on the lachrymal sac receive due consideration.

The inclusion of such diseases as thyroglossal cyst, pituitary tumour, and cleft palate shows how this branch of surgery is gradually annexing new territory. There is a useful section on skiagraphy of nasal sinuses, mastoid, etc. On account of its brevity and systematic arrangement, the book will chiefly appeal to the student, whose knowledge may later be supplemented by a perusal of the larger and more comprehensive works.

The practitioner, however, who seeks for guidance in the diagnosis of an obscure ear case, or for a description of such operative procedures as he may feel justified in attempting, will require information of a more detailed nature. Through lack of space, the author has been obliged to dispense his information in tabloid form, and his book has suffered a little in consequence. The short notes on operations, such as those on the nasal accessory sinuses, would have been rendered more clearly intelligible by a brief outline of the anatomy of the parts.

Again, the rationale of the vestibular tests is difficult to understand without some preliminary knowledge of the anatomy of the labyrinth and the perusal of a few diagrams showing the endolymph movements. All will not approve of the use of forceps to remove a foreign body from the ear, although the author goes on to say that the syringe is the safest instrument. Nor will the statement that the head is always thrown well back in cesophagoscopy and bronchoscopy meet with general acceptance; indeed, many strongly advocate that the head should remain "straight" on the table. Despite these minor defects, however, the book may be regarded as a useful introduction to diseases of the nose, throat, and ear, and may be confidently commended to all who wish to master the essentials of the subject with a minimum of reading.

## NEW EDITIONS

*Text-book of Gynæcological Surgery.* By COMYNS BERKELEY and VICTOR BONNEY. Second Edition. Pp. xiii + 829, with 505 illustrations. London: Cassell & Co., Ltd. 1920. Price 42s. net.

In this edition the authors have added considerably to the original volume both in matter and in illustrations. Some chapters have been practically rewritten. The surgical treatment of displacements has been reconsidered in this volume in the light of the author's increased experience, the subject of shock has been expanded, and a number of operations not previously given are described in detail, notably abdomino-perineal excision of the rectum. The improvements help to increase the value of a book which has already established itself as one of the best treatises on the surgery of the female pelvis. It is especially useful to the young specialist and to the surgeon who has not had the opportunity of acquiring a first-hand knowledge of gynecological practice.

*Herman's Difficult Labour.* Sixth Edition, revised and enlarged by CARLTON OLDFIELD, M.D. Lond., F.R.C.S. Eng. With 198 illustrations. London: Cassell & Co., Ltd. 1920. Price 16s.

Notwithstanding the existence of many excellent works on Obstetrics, large and small, *Herman's Difficult Labour* occupies a unique position in the literature of the subject. The author is purposely very dogmatic. From many treatises the learner finds many things that he *may* do, but he is not always clearly told which is the best. In this book the student and practitioner are clearly told the *best* way of dealing with each complication of labour and why the author believes it is the best.

The author first of all insists on the importance of a thorough examination of every pregnant woman some weeks before labour is due, and then a section of the book is devoted to the management of malpositions and malpresentations. Naturally the commonest of all causes of lingering labour—occipito-posterior positions—are fully dealt with, and the practitioner is advised to correct these if possible by abdominal manipulation before the membranes have ruptured. If the case is seen later and the advance of the head ceases, artificial manual rotation of the head and shoulders by the vagina-abdominal method is advised. The author does not favour rotation by the forceps on account of possible damage to mother and child, but we have never seen any ill-effects from this method, and have found it eminently successful when all other methods have failed. The teaching on the management of malpresentations is sound, but we cannot agree that forceps should never be used in breech cases. When the breech is large and a leg cannot be reached the forceps often do extremely well.



## New Editions

The chapter on Uterine Inertia is excellent, and one is glad to note that the dangers of pituitary extract and ergot in stimulating weak pains are carefully insisted upon. The indications for the use of these drugs are accurately given.

As is only natural when the work is one on difficult labour, a large section of the book is devoted to abnormal pelvis: every possible deformity is clearly described, and correct rules for management are definitely stated. The chapters on tumours complicating labour and on rupture of the uterus and other parts contain much useful advice, while no better account of treatment could be found than is given in those on the various hæmorrhages of pregnancy and labour.

As regards obstetric operations one is glad to notice that version is given its proper place as a useful means of terminating labour in many cases. In some schools there is a tendency to forget the value of turning. The author is not enthusiastic about symphysiotomy, and condemns pubiotomy. Results do not justify this, and most obstetricians to-day prefer the latter. It is not pointed out that these operations are supplementary to the use of the forceps. It is only after forceps fail that the operations are justified, and therein lies their advantage, for the operations can be performed after forceps fail, while Cæsarean section is then generally out of the question. In the chapter on induction of premature labour the author says that if labour pains have not begun at the end of twenty-four hours after the introduction of bougies, you may conclude that the method is a failure in the case in question. In our experience the bougies frequently take longer than that before initiating contractions and then do so effectually. Excellent chapters on retroversion of the gravid uterus and on eclampsia complete the volume.

*Herman's Difficult Labour* has been carefully revised and brought up to date by Dr Oldfield. There is one important omission in that there is no discussion of the place of morphia-scopolamine narcosis in the management of tedious labours. In many conditions, such as in slightly contracted pelvis, and in the case of large fetal heads where time for moulding and mechanism is so essential, no form of treatment contributes to this so markedly as so-called "twilight sleep." In a large proportion of such cases it diminishes the suffering of the patient to an extraordinary extent. So also in cases of uterine inertia, rigid cervix and unyielding soft parts, this form of treatment may play a very important and beneficial part.

Apart from that, the work is an excellent and reliable guide to the management of difficult labour and cannot fail to maintain its place amongst the best books on obstetrics because of its clearness and its definiteness.

## NOTES ON BOOKS

The Middle Ages are gradually coming into their own. Enlightened historical criticism has already dispelled many erroneous opinions regarding this period, but our mental picture of *Medieval Medicine* is still sadly lacking in definition. It was a happy thought, therefore, on the part of Messrs A. & C. Black to add a book on this subject to their series of "Manuals of Medical History" (*Medieval Medicine*, by James J. Walsh, M.D., price 7s. 6d. net). Dr Walsh has brought to the task a wide knowledge of the subject, and his book can be recommended as giving a more correct view than is generally entertained. Unfortunately he has not made the most of his opportunity, and he has been betrayed here and there into statements which are doubtful or erroneous. There is, moreover, a sad lack of precise references to original authorities. Thus, his quotations from Paulus Aegineta are taken verbatim from Adams' translation but without any acknowledgment, though these three volumes of Adams give in themselves an admirable summary of Medical Knowledge at the beginning of the Middle Ages.

Mr Arthur Cooper's *Sexual Disabilities of Man* (H. K. Lewis & Co., Ltd., price 7s. 6d. net), now in its fourth edition, fills a useful place in the literature of the subject.

## BOOKS RECEIVED

- BALFOUR, ANDREW. War against Tropical Disease  
(*Baillière, Tindall & Cox*) 12s. 6d.
- BARTON, G. A. H. Backwaters of Lethe (Some Anæsthetic Notions)  
(*H. K. Lewis & Co., Ltd.*) 5s.
- BLAND-SUTTON, SIR JOHN. Lectures and Essays: Ligaments. Fourth  
Edition . . . . (*Wm. Heinemann (Medical Books), Ltd.*) 15s.
- BUCURA, C. "Hamophile" beim Weibe . . . . (*Alfred Hölder*) M. 11.20.
- CODD, M. A. Induction Coil Design . . . . (*E. & F. N. Spon, Ltd.*) £1, 1s.
- COW, DOUGLAS. Pharmacology . . . . (*J. & A. Churchill*) 7s. 6d.
- CRUCHET, RENÉ, and RENÉ HOULINIRE. Air Sickness  
(*John Bale, Sons & Danielsson, Ltd.*) 5s.
- CULPIN, MILLAIS. Psychoneuroses of War and Peace  
(*Cambridge University Press*) 10s.
- DUCLAUX, EMILE. Pasteur: The History of a Mind. (Translated by  
Erwin P. Smith and Florence Hedges) (*W. B. Saunders Co., Ltd.*) 2½s.
- FINKELNBURG, DR RUDOLPH. Edited by, Die Therapie an den Bonner  
Universitätskliniken. Third Edition  
(*A. Marcus & E. Webers Verlag.*) Geh. M. 36; Geb. M. 44.40
- GHOSH, RAKHALDAS. A treatise on Materia Medica and Therapeutics.  
Eighth Edition . . (*Simpkin Marshall, Hamilton, Kent, & Co. Ltd.*) 9s.
- GILLIES, H. D. Plastic Surgery of the Face  
(*Henry Frowde and Hodder & Stoughton*) £3, 3s.

## Books Received

<p>GRIFFITH, J. P. CROZER. The Diseases of Infants and Children. In two vols. . . . . (W. B. Saunders Co. Ltd.)</p> <p>HEAD, HENRY. Studies in Neurology. In two Vols. (Henry Frowde and Hodder &amp; Stoughton)</p> <p>HEAD, JOSEPH. Everyday Health Hygiene (W. B. Saunders Co., Ltd.)</p> <p>JAMES, S. P. Malaria at Home and Abroad (John Bale, Sons &amp; Danielsson, Ltd.)</p> <p>KENWOOD, H. R. Public Health Laboratory Work (Chemistry). Seventh Edition . . . . . (H. K. Lewis &amp; Co., Ltd.)</p> <p>KIDD, FRANK. Common Infections of the Kidneys (Henry Frowde and Hodder &amp; Stoughton)</p> <p>KYNASTON, JOHN. Cure of Adenoids and Enlarged Tonsils without Operation . . . . . (St Catherine Press)</p> <p>LEWIS, THOMAS. The Mechanism and Graphic Registration of the Heart-beat . . . . . (Shaw &amp; Sons)</p> <p>LUMB, NORMAN. The Systematic Treatment of Gonorrhœa in the Male. Second Edition . . . . . (H. K. Lewis &amp; Co., Ltd.)</p> <p>M'DONAGH, J. E. R. Venereal Diseases: Their Clinical Aspect and Treatment . . . . . (William Heinemann (Medical Books) Ltd.)</p> <p>MARTINDALE, W. HARRISON and W. WYNN WESTCOTT. The Extra Pharmacopœia. Vol. I. Seventeenth Edition (H. K. Lewis &amp; Co., Ltd.)</p> <p>MODI, RAI BAHADUR JAISING P. A Text-Book of Medical Jurisprudence and Toxicology . . . . . (Butterworth &amp; Co. (India), Ltd.)</p> <p>PEARL, RAYMOND. The Nation's Food . . . . . (W. B. Saunders Co.)</p> <p>PORTER, CHARLES. Sanitary Law. Second Edition (Longmans, Green &amp; Co.)</p> <p>ROBINSON, ARTHUR. Cunningham's Manual of Practical Anatomy. Seventh Edition, Vol. III. (Henry Frowde and Hodder &amp; Stoughton)</p> <p>ROTH, PAUL BERNARD. Orthopædics for Practitioners (Edward Arnold)</p> <p>STOCKMAN, RALPH. Rheumatism and Arthritis (W. Green &amp; Sons, Ltd.)</p> <p>TRANSACTIONS OF THE AMERICAN ASSOCIATION OF GENITO-URINARY SURGEONS. Volume XII. 1919.</p> <p>TREDGOLD, A. F. Mental Deficiency. Third Edition (Baillière, Tindall &amp; Cox)</p> <p>WARFIELD, LOUIS M. Arteriosclerosis and Hypertension. Third Edition (Henry Kimpton)</p> <p>WHITTAKER, C. R. Surgical Anatomy. Second Edition. Part I. (E. &amp; S. Livingstone)</p>	<p>The Set, £3, 12s.</p> <p>Per Set, £3, 3s.</p> <p>5s.</p> <p>25s.</p> <p>15s.</p> <p>18s.</p> <p>1s.</p> <p>£2, 7s. 6d.</p> <p>5s.</p> <p>£3, 3s.</p> <p>£1, 7s.</p> <p>—</p> <p>16s.</p> <p>6s. 6d.</p> <p>12s. 6d.</p> <p>10s. 6d.</p> <p>15s.</p> <p>—</p> <p>£1, 5s.</p> <p>£1, 4s.</p> <p>1s. 9d.</p>
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## ANALYTICAL NOTE.

DOLS' (VOLATALISE) FLANNEL (DOLS & CO., HUDDERSFIELD).

WE have received examples of bandages and body-belts made of this material, which is recommended as a soothing application in cases of rheumatism, lumbago, sciatica, and other forms of fibrositis. It is a fine form of flannel impregnated with a chemical product which gives off yellow rays at the body temperature. A mild degree of hyperæmia is produced after the bandage has been in position for a short time, and to this the beneficial action is attributable.



# Edinburgh Medical Journal

*September 1920*

## VALEDICTORY ADDRESS TO THE EDINBURGH OBSTETRICAL SOCIETY.\*

By PROFESSOR SIR J. HALLIDAY CROOM.

IN relinquishing into your hands the responsibility of this Chair which, through the force of circumstances, I have occupied far too long, I do so with the most profound thanks, acknowledging from the bottom of my heart your too great generosity to me. Only one who is filled with self-complacency can stand where I stand without feeling humbled. The memories that gather round this Chair appeal to me with oppressing weight, and I can only to-night record my grateful thanks for all the confidence you have reposed in me so often and so long, and my hope that you will forgive my many shortcomings and deficiencies in the duties and responsibilities of the office from which I now retire.

To promote the highest interests of the Edinburgh Obstetrical Society must be the paramount desire of us all, and it is therefore with unalloyed pleasure that I transfer the duties of this Chair, in response to your unanimous choice, to one who has devoted his whole life to the science, practice, and teaching of obstetrics and gynaecology, and whose position is unchallenged—one whom I am proud to call my intimate friend, my colleague, and my former pupil—Dr William Fordyce.

During the catastrophes which have overtaken the world, and from which we are only now emerging, all scientific societies have more or less been in abeyance, and we may congratulate ourselves upon the fact that we have survived the storm and are now able to resume our ordinary duties.

Gentlemen, the opening night of another session cannot but awaken in some of us memories, as strange as they are sad, of the days and forms that are no more.

\* Being President's Valedictory Address for Session 1919-20.

## Sir J. Halliday Croom

My first duty is the melancholy one of recalling the names of those Fellows of this Society whose work has been transferred to another sphere of clearer vision and larger opportunity, knowing now what they knew not here. As of Arthur Hallam so of them—God's finger touched them and they slept. But behind the veil—

The great intelligences fair  
That range above our mortal state,  
In circle round the blessed gate,  
Received and gave them welcome there ;

And led them through the blissful climes,  
And showed them in the fountains fresh  
All knowledge that the sons of flesh  
Shall gather in the cycled time.

During these fateful years through which we have passed, the catalogue of those whom death has claimed is endless. I should exhaust the limited time at my disposal were I to attempt to do even passing justice to each one of them. It would be impossible for me not to refer, however inadequately, to him who for three different terms presided over the destinies of this Society, and who during the long tenure of his Chair took a most profound and deep interest in all its work. I refer to Professor Sir Alexander Simpson.

I dare offer you an appreciation of him, because he was the personal friend of us all. We all realise only too well the loss this Society has sustained by his death. Through all the years in which he adorned the Chair of Obstetrics in this University he laboured unweariedly for the benefit of this Society, and whether as President, as a member of Council, or as an ordinary Fellow, he was during all that time, if I may venture to say so, its figurehead. If ever any one left the world richer by passing through it was he. His helping hand is at rest.

We have lost him : he is gone :  
We know him now : all narrow jealousies  
Are silent ; and we see him as he moved,  
How modest, kindly, all accomplish'd, wise,  
With what sublime repression of himself.

It would be quite unbecoming on my part were I to make any extended reference to the loss the University and the profession have sustained in the death of Sir William Turner, who was an Honorary Fellow of this Society, and who con-

## Valedictory Address to Obstetrical Society

tributed many important observations on placentation. During his long connection with the University as a professor and his subsequent elevation to principalship he not only did remarkable and outstanding work in anatomy, but during that long period he lived for the University and for the advancement of medical education.

Since our last meeting France has lost two of her most distinguished gynaecologists, both of whom were Honorary Fellows of this Society.

Doyen was celebrated all over the world as one of the most brilliant, successful, and enterprising gynaecological surgeons.

Pozzi died unfortunately at the hands of an assassin on whom he had previously operated. A prolific writer, his contributions to gynaecology were both extensive and valuable, and his work is universally recognised.

Among the non-resident Fellows who, from time to time, have been elevated to the Presidentship of the Society, none adorned the Chair more than Dr Ballantyne of Dalkeith. His large clinical experience and his uniform courtesy and kindness made his occupancy of the President's Chair a most successful and exceptionally agreeable one for us all.

Professor Stephenson of Aberdeen, during his residence in Edinburgh, filled various offices in this Society and contributed many able and valuable papers to it. After his removal to Aberdeen he continued his interest in our work by frequent visits to Edinburgh, and by many contributions. He presided over this Society with great acceptance for a period of three years.

Amongst the ordinary Fellows who have been called from us I should like first to refer to Dr William Taylor, who recalls to me all the earliest associations of my student life, and with whom I had many personal relations. His remarkable personality, his genial disposition, his keen sense of humour, his broad view of life, and the absence in his nature of any personal animosity, endeared him to all who knew him.

No one was more interested in the work of this Society than Dr Henry Church. He was very extensively read and had an eminently scientific mind. We can profit much by a study of Dr Church's life, his habits of industry, his tolerance of the faults of others, his infinite courtesy, his transparent honesty, and his conscientiousness regarding the welfare of his patients which will always be remembered. He has left a



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permanent record of his interest in this Society by his gift to us of the very handsome presidential chair which I now vacate.

As the result of an accident Dr Lundie was cut off in the midst of his work. His loss is deplored not only by ourselves, but by a large clientele of patients who were devoted to him. He was a man of extensive culture and deeply interested in science as his two well-known papers to the Royal Society illustrate. The one on "the passage of water and other substances through india-rubber film," and the other on the obscure subject of Dew Bows. Dr Lundie was the kindest and gentlest of friends.

It would be impossible for me on an occasion such as the present to fail to refer, with profound regret, to the loss which this Society has sustained by the death of its secretary, Dr Edward Scott Carmichael. He was one of the most interesting pupils with whom I ever had to deal. He laid the foundation of his career by an excellent knowledge of surgery, and he ultimately fulfilled his métier in life by devoting himself to gynæcological work. He was an expert operator, a gentle and agreeable colleague, and he enriched the literature of the profession by many able contributions. Young though he was at his death, his memory will be kept green amongst us for many a day to come. He had an exceptionally brilliant career in store for him.

Dr Borrowman was an active member of the Council of this Society, and although he did not contribute to our transactions, yet he took a deep interest in the work of the Society.

Dr Elsie Inglis, who distinguished herself pre-eminently amongst all the lady medicals, was an earnest and regular worker here, and achieved for herself a distinguished place among the medical officers who have suffered and perished in the recent war. There are few women who have raised themselves to a higher plane than she has done, and she has been the recipient of many well-deserved posthumous honours.

It would be impossible for me to refer to all the other Fellows who have gone from amongst us recently. Faithful though not famous, the reward of the faithful they now enjoy.

We must recall with pleasure and pride those fellows of the Society who have served with the colours. It would be invidious to mention individual names when we realise that every Fellow of our Society whose age permitted served his king and country. The least our Society can do is to

## Valedictory Address to Obstetrical Society

congratulate them on their service and welcome them back again into civil life and to the pursuit of their less adventurous and more prosaic scientific and professional work. In their patriotism may they now enjoy their eternal reward.

We are so accustomed to regard midwifery as one of the more scientific portions of medicine that we are apt to forget the numerous blanks that exist in our knowledge, accounting for many of the problems which confront the practitioner who has charge of a pregnant woman. The art of practical obstetrics has made immense advances of recent years, and when it is practised in a well conducted lying-in hospital, it may be said as a general rule, to be accurate so far as the practical problems involved are concerned, and I think it may be said that the results are more nearly perfect than those obtained in almost any other branch of medicine. The question, therefore, which I think suggests itself is: Why is it that there is still so heavy a mortality from pregnancy, parturition, and the puerperium? What explanation is there for the fact that 3000 women or more die from diseases or accidents of childbirth every year? If every lying-in woman were obliged to enter a lying-in hospital for her confinement, and if she were compelled to place herself during the course of her pregnancy under the care of an expert, this death-rate would, to a very large extent, disappear. This is a condition of matters which is never likely to be realised, and in any case a certain number of the complications of pregnancy would still remain.

Our ignorance of the toxæmias of pregnancy is very marked, and probably our conception of the presence of toxins in the mother's tissues and circulation may be quite erroneous. The chemical nature of these toxins is very complex, and cannot be recognised by the expert, still less by the ordinary medical attendant. So it comes that chemical pathology forms a very important addition to pathology generally, and the importance of this branch of research is becoming greater every day. If such investigations are to be carried on with any success it is obvious they must be conducted under the direction of a trained scientific observer, who has at his disposal the necessary laboratory and skilled assistants to carry out such special work. The modern development of midwifery must be along the lines of chemistry and bacteriology, more especially in the difficult and complex question of the toxæmias of pregnancy.

The necessity, therefore, for prematernity beds in every

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hospital is essential, where women can be kept under observation during the latter weeks or months even of their pregnancies. This system that has so long prevailed of admitting a patient into hospital only after the onset of labour is distinctly and evidently a bad one. The extension of prematernity beds is very clamant, for there and there only can the clinician supply to the pathologist, whether chemical or otherwise, the necessary material for scientific investigation. It is indeed this antenatal, prematernity, and child-welfare work which is pressing itself upon and gaining the attention of the profession as well as the public.

The aims of antenatal and child-welfare work are both attractive and urgent. The infant has generally been neglected in this regard. Hitherto it has never had the chance of profiting, in an organised manner, from the advancements in knowledge calculated to preserve and add to its vitality. Ignorance of its special requirements has been allowed to environ its existence, and from its birth it has had to struggle to live, in the course of which disease generally has closed the scene with death. All this is now in process of change. The State has taken the infant under its charge; the tender hold the infant has on life has become the object of solicitous care; its struggles to live have ended, under a beneficent law, designed to protect its well-being.

Notwithstanding all that has been done, we must admit that our knowledge of many of the problems of antenatal pathology is very scanty. But it continues to be a fruitful field for investigation, and without doubt research in this direction, which will be much more possible in the near future than it has ever been before, will yield abundant results. The interest awakened on the part of the public generally in this matter has been very marked recently, and maternity and child-welfare centres are springing up all over the country. It is essentially true that the knowledge gained from these centres is precisely the knowledge which the medical student should possess, and under a system of organisation these centres should enable them so to acquire it. We may assume that so far as the medical student is concerned, a way could be found by which these infants' welfare clinics might be made available for instruction, and it should be made possible for the authorities of the clinics and of the medical centres to enter into an arrangement to secure that object.



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It is said that it is more dangerous to be a baby in a large city than a soldier in the trenches, but we may look forward to the time—nay, the time has already arrived—when it is impossible to level such a reproach upon the nation, for the death-rate among the infants is in reality the concern of every one of us, and after all we are, as a nation, asking for more children while we cannot, or will not, keep alive the children we have. Perhaps it would be more to the point to say—take care of the death-rate and the birth-rate will take care of itself.

It is important to cultivate efficiency from the very beginning, that is, from the pre-natal period. The excess of females over males is one of the most serious problems which the immediate future will have to face. The general decline in the birth-rate is in itself serious enough, but the relative decline in males, or as it has been called, the negative masculinity, is a matter which demands close attention, and this attention must be concentrated on pre-natal conditions and infantile mortality. The present negative masculinity is due not so much to the well-known disproportion between males and females at birth but to the much greater mortality among male children than female. All over the country many more boys are dying than girls. Take, for example, two instances. In the rural district of Westmoreland 48 boys under a year old die to 21 girls; while in Wiltshire the ratio was 135 to 78 girls. Such startling ratios as these must evidently be explicable. They cannot be due to mere chance. But this is a question which I cannot stop to elaborate to-night. Havelock Ellis will help you in your studies in this direction.

One of the many difficulties yet to be overcome ere true child welfare is attained, is the appalling fact that huge numbers of infants brought up on the bottle never see cows' milk. For the whole kingdom the consumption of milk is only *one quarter of a pint per head per day*; and if infants and children up to six years of age get the milk that their system requires there would be absolutely no milk left for anybody else, of all the quantity of fresh milk produced in Britain. Considerations such as these show how much, in different ways, remains to be done by this new Scottish Board of Health before their labours are ended or justified.

Perhaps the most practical advance that has been made in our department since the war is the inception and establishment

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of the Central Midwives Board, which formerly was under the ægis of the Privy Council, but is now under the Ministry of Health, or, as it is called in Scotland, the Scottish Board of Health.

Although the present Central Midwives Board for Scotland is the outcome of the Act passed in December 1915, yet it must be borne in mind that the necessity for the legislation of midwives was realised long before this. In the early days of the infantile mortality movement the Society of Medical Officers of Health, impressed as they were by the importance of the subject, realised the necessity for the control of midwives, and a Bill was drafted, which, however, fell through. Later on another was introduced by Lord Balfour of Burleigh in 1914, but was dropped in the House of Commons mainly for want of time at the end of a busy session. The Act of 23rd December 1915 owes its origin to a memorial signed by the Deans of the Medical Faculties of the Universities, the Presidents of the Royal Medical Corporations, and the Medical Officers of the Maternity Hospitals in Scotland. In pressing the claims of the Bill the memorialists realised the striking change that had occurred in England after the passing of the Midwives Act, the mortality from sepsis having fallen very materially.

On the 18th February 1916 the Board was duly constituted. In dealing with the applications for admission to the roll it was obvious that all those women who had practised midwifery previous to the passing of this Act were entitled to be placed on the roll provided they could give satisfactory evidence of at least a year's experience, and of moral character. These were called *bona fide* nurses. They were placed on the roll without any further examination at all, on the same principle as those practising dental surgery were admitted on the passing of the Dental Act. Again, those producing certificates from recognised institutions, like the maternity hospitals, were admitted, and, lastly, of course, those who were qualified by passing the Central Midwives Board examination.

The number of midwives on the roll at 31st March 1919 was 3591. Of that number, 1714 had been enrolled as having been in *bona fide* practice. The remainder were trained midwives numbering 1877, and it has to be noted that during the three years of the Board's work 480 have passed its examination.

The examination is conducted in Edinburgh, Glasgow,

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Dundee, and Aberdeen quarterly, on a rotation of examiners from the different centres, thus ensuring the same standard of requirement in each part of the country. The Examiners' List contains the names of all the leading specialists in the subject in Scotland. I ought to make this reservation, that under the Act the members of the Board cannot be employed as examiners, and they therefore are not included in the list. The average pass mark shows a high standard. It has to be kept in view that special emphasis, as is required by the Act, is put upon the Practical and Oral examination as against the Written, thus eliminating the claims of the candidate who relies solely on 'book-work.

With an entry of about 120 candidates at each quarterly examination there is a prospect of an additional 400 nurses each year, which should go a long way to reducing the trials of the medical practitioner situated either in town or country.

It is interesting to record that the local supervising authority of Port Glasgow has initiated a scheme, with the approval of the Board of Health, whereby a bonus of 5s. for each birth notified is given to every certificated midwife. The object is to do away with the handy woman.

At the present time every training school is booked fully up to April 1920, and the demand for instruction in this class of work cannot be met. It is regrettable that immediate provision cannot be made for the admission of a large number of war widows desiring training, and whose curriculum is being paid for by the Ministry of Pensions.

*Penal Cases.*—An important part of the work of the Board is the exercise of its penal jurisdiction under section 5 (5) of the Act. The Board have had a large number of cases reported for malpractice, negligence, or misconduct. After the hearing of their cases the names of three women were removed from the roll, five others were suspended for various periods, and in a very large number of minor offences reported by the local supervising authorities a warning was administered. These decisions, duly reported in the Nursing Press, have had a salutary effect.

The reports from the Medical Officers of Health of the different areas show that the provisions of the Act are being given full effect to; and further, in some of the principal areas provision has been made for the holding of classes, the giving of lectures, practical tuition, etc., as authorised under section 21 of



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the Act, to many *bona fide* midwives who have not received recognised training.

I think, as Chairman of the Board, I can claim that it has done its duty.

We have witnessed during the past few years the press discussing with unlimited freedom a question as unsavoury for the general community as has ever been brought under public notice. Syphilis and gonorrhœa have now become terms added to the vocabulary of millions of our population to whom such terms were formerly unknown. Why is all this publicity necessary? The answer is that the time has come when the nation must be roused to the awful effects of venereal disease, which hitherto it has only dimly recognised. It is not for me to elaborate the awful results of syphilis and gonorrhœa, or to point out the menace they are to the individual, to the family, and to the State. They have hitherto been concealed from publicity under a cloak of false modesty, and the barrier of secrecy had to be removed in some way, and no other way of doing this was available other than that of speaking out in no uncertain language in order that every one should clearly understand the truth. The wisdom of this expedient is unquestionable, and the results have fully justified it. The nation has now been made acquainted with the peril of venereal disease, the facts have been established by a Royal Commission, an Act has been added to the statute book based upon the report of that Commission, and the campaign so far conducted against this menace to the race, it is interesting to note, offers a fair prospect of arresting, under efficient organisation, the progress of this pernicious evil.

Our department has not been slow in advancing along these lines, because there has been established in the Maternity Hospital in Edinburgh venereal wards under the special supervision of Dr Ballantyne, and I think the Hospital is to be congratulated on this arrangement. Gentlemen, we are out to fight to the death the gonococcus and the spirochæte, two of the deadly enemies of the human race, and although we may not all be quite agreed as to the best method for preventing infection or in dealing with infection after it has been set up, we must not allow ourselves to be influenced too much by oversensitiveness, or to be too squeamish in our dealings with it. At whatever cost we must fight these two enemies to a finish.

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The Government has offered to defray three-quarters of all approved expenditure on the treatment of these diseases, and centres are being established with great rapidity up and down the country. I think the Government will find that this is a sound investment for the money of the nation, although it naturally is one of the increasing cases in which the private practitioner sees the Government taking away his income, experience, and advancement. This is a grievance, but I think it is one which can be remedied.

To live is sometimes very difficult, but it is never meritorious in itself, and we must have a reason to allege to our own conscience why we should continue to exist on this crowded earth. This may seem a hard condition, but without it we cannot realise the mission that glows in the natural desire to leave the world better than we found it. In looking back through a vista of years and old memories—*tempora labuntur tacitisque senescimus annis*—I am optimistic enough to re-echo Whittier's article of belief and to make my last adieu to you all in his words, so full of good cheer and of eternal hope: "Of course the world is growing better, the Lord reigns, our old planet is swinging slowly into full light. I despair of nothing good, all will come in due time that is really needed and all we have to do is to work and wait."

# THE IMPORTANCE OF SYMPTOMS IN MEDICAL PRACTICE AND RESEARCH.

By SIR JAMES MACKENZIE, LL.D., M.D., F.R.S., etc.

## 1. The Science of Medicine.

THERE are many matters in Medicine seemingly so simple that it is taken for granted they are beyond further discussion or investigation. Of these simple matters, the symptoms common to ill-health are the most prominent. Ever since Medicine was seriously studied, symptoms have received attention, and the notion is firmly held by medical men, specialists, physicians, surgeons, and experts of all kinds, that the symptoms revealed by the doctor's unaided senses are so well understood that the information to be gathered from them has been exhausted, and that their further study is not necessary to the progress of Medicine; hence has arisen the belief that for the progress of Clinical Medicine new methods are necessary for further elucidation of symptoms.

This mistaken attitude towards symptoms is not only misleading, but hampers Medicine in practice and research. Indeed, the importance of symptoms is so imperfectly realised that an accurate description of the meaning, mechanism, and significance of symptoms is nowhere to be found, and constitutes a great defect in medical knowledge.

Although this defect in the knowledge of symptoms may be recognised it is not easy to understand how it is to be remedied. This is due to the fact that, notwithstanding the strenuous efforts that have been made to advance medical knowledge, the manner in which medical science should be prosecuted has never been understood. It has been assumed that investigation in Clinical Medicine was a simple matter, and that any one with the usual medical education was fitted to undertake clinical research. It has never been recognised that for its research principles and methods are required which are different from those used in other branches of medical science, while a long training of the investigator is necessary, of a kind rarely undertaken.



# Importance of Symptoms in Medical Practice

## 2. The Importance of Symptoms in Diagnosis.

The urgent need for a better knowledge of symptoms can only be realised if the great defects in medical knowledge are recognised. The general practitioners are the people who are brought into contact with the illnesses which impair the health of the community. An analysis of the complaints which the general practitioner sees, reveals the present state of medical knowledge. If we put aside the trivial ailments, and consider the illnesses which lower the health of the great majority of people, it is found that only a small percentage (5 to 10) are capable of being diagnosed with any degree of accuracy. Most of this small percentage are cases of disease so advanced that the organs are damaged beyond repair, as apoplexy, chronic Bright's disease, gangrene of the feet, advanced heart disease, and these are the end-results of a long period of ill-health, whilst the origin of the ill-health was not detectable. Even such diseases as consumption, and gastric ulcer, are in all probability secondary or superadded diseases—at all events the diagnosis before gross changes take place cannot be made.

The backward state of diagnosis is illustrated in these two latter conditions. They are such common complaints, and have been the subject of long and careful investigation by innumerable doctors, yet to-day we cannot detect consumption until the lungs are damaged, usually beyond repair, while, as regards gastric ulcer, Sir Berkeley Moynihan, out of his great experience, comments on the difficulty in diagnosis, and states that it is disheartening and humiliating to ponder over the mistakes in diagnosis made by careful and experienced medical men, that have been revealed in operation.

To appreciate the significance of this lack of knowledge of diagnosis one has to see it in relation to the health of a community. In a town of 100,000 inhabitants 25,000 will likely consult doctors in one year. 5000 may suffer from trivial complaints and accidents. Of the 20,000, only a small proportion will suffer from diseases that are diagnosable, say 2000. We have then, in a population of 100,000, 18,000 people ailing, of the nature of whose complaints we are still profoundly ignorant.

When the significance of these figures are grasped it will be seen that there is an urgent need for some method in the investigation of disease, different from that which has been pursued in the past.

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## 3. The Importance of Symptoms in Prognosis.

Prognosis is the judgment of the significance of symptoms as indicating the future course of the patient's complaint. A knowledge of this branch of Medicine is absolutely essential to the intelligent practice of Medicine, and it concerns every one who has to deal with the sick. Before any course of treatment is taken it is necessary to understand whether the complaint is amenable to treatment. The fitness for the patient to do his work, or to live in a given place, all depends on a knowledge of prognosis. It is scarcely necessary to refer to its importance in regard to life insurance and the examination for military, naval, and Government services.

A knowledge of prognosis can only be acquired by the detection of symptoms and the ability to recognise whether these symptoms are the expression of a diseased state or merely a variation of the normal, indicative neither of disease nor of impairment. When it is recognised that the symptoms are an expression of disease, it is necessary to tell whether they represent a damage to the body which impairs its functions, and whether the damage is stationary or progressive.

The need for this kind of knowledge is readily visualised if some illustration be given by reference to well-established practice. Many eminent and experienced surgeons have seen disastrous results from a delay in operating an appendicitis, so that they strongly recommend that all suspect appendices should be removed. The result of such a procedure is that a great many people are subjected to the operation when there is no disease of the appendix. This is simply due to the fact that medical knowledge has not advanced so far as to interpret correctly the symptoms of appendicitis, nor to understand their significance, so that large numbers are operated upon unnecessarily. Antitoxin is believed to be such a potent remedy in diphtheria that, as a matter of routine, every one who contracts this disease is given it. We know that diphtheria, in the majority of cases, is not a serious disease, yet, because of an absence of knowledge of prognosis, the remedy is given indiscriminately to every one.

It will be said, of course, that in the case of appendicitis and diphtheria, it is impossible to foretell which cases will become dangerous, but that is merely stating in another way the fact that medical knowledge has not yet advanced far

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enough to understand the prognostic significance of certain symptoms.

Not only has medical knowledge not advanced so far as to permit a prognosis in such instances, but it has not gone so far as to recognise either the importance of the subject or the manner in which the knowledge can be acquired. A little consideration will reveal that this knowledge can only come from a long experience, yet in matters dealing essentially with prognosis, such as in life insurance examinations, and in recruiting, a medical qualification is deemed to carry with it the ability to give a prognosis, and young doctors with little experience are expected to give one.

When the real significance of a prognosis comes to be understood, the attitude of the profession to-day will seem amazing. There is no branch of Medicine which requires so profound a knowledge of disease and its manifestations, a knowledge that can only come through long experience and painstaking observation of symptoms. But so far the profession has not yet awakened to the great defect in knowledge of this very important subject, and how little progress is being made in its development.

It is now more than forty years since, as a young graduate, I was permitted to examine a lady with a systolic murmur. It had been discovered accidentally by a distinguished Edinburgh physician, and he had ordered the patient to bed and prescribed digitalis, which she was taking in large quantities. She and her husband were warned of the danger of the heart condition, particularly in regard to pregnancy. For a time a careful life was led, but gradually she resumed her old life, and lived for a great many years an energetic life. Although the murmur persisted she is now well over 70 years of age and shows no sign of heart failure. A short time ago I was asked to see a youth, who had been confined to bed for three months because a physician attached to a large teaching hospital had detected a systolic murmur, which I had no difficulty in recognising as being physiological. This inability to recognise the prognostic significance of a murmur is not exceptional by any means, and I place these two instances in juxtaposition to show how little progress has been made in forty years in even such a simple matter as this. But one has evidences of this lack of progress everywhere, and nowhere more strikingly than in the matter of life insurance. The medical forms in regard to the



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circulation have scarcely altered, if at all, for over fifty years, as if medical science had not advanced since then.

Nor is there any prospect of advance in this important matter till a better knowledge of symptoms is acquired, and it is recognised that the only person who can advance this kind of knowledge is one who has the opportunity of seeing the progress of disease in individual patients, watching them intelligently through complaints from start to finish.

### 4. The Importance of Symptoms in Treatment.

Treatment which consists of the introduction into the body of an agent—drug, vaccine, serum, electricity, X-rays, radium emanation—produces reactions, often indistinguishable from the symptoms produced by certain diseases, as in patients with vomiting, diarrhoea, drowsiness, headache. Certain of these remedies act by removing a noxious agent, as by vomiting or purging or by killing it, as mercury in syphilis. But the vast majority of remedies, when they have any effect, act by modifying the symptoms of disease. This is the justification for treatment, particularly in the case of suffering—to relieve the distressful symptoms. It will thus be seen how important is a knowledge of symptoms for the intelligent investigation of drugs or other remedy. The drugs which find a place in the pharmacopœia have never been studied from this point of view, with the result that a great number of utterly useless drugs are included, while those which are of use have never been studied with that care and accuracy necessary to recognise the real effect of the drug on the diseased human being. Experimental investigation shows how a drug may act on healthy tissues, but drugs are not given to the healthy but to the sick who show symptoms of disease, and it is for the removal of the causes of the symptoms or for their modification the remedy is given. This is well illustrated by the use of digitalis. For 150 years the drug was known to have a beneficent effect in heart disease, but no clear conception of the kind of case existed, so that it was given indiscriminately to all patients who had or were supposed to have a cardiac affection. Many attempts had been made to find out its effect in the human heart, including experiments on animals, but it was not until the symptoms, particularly the abnormal rhythms, were understood that its effect on the human heart was discovered, and the kind of case in which it acted beneficially was recognised.

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The principle which guided to this discovery was the intelligent perception of the symptoms with a knowledge of their mechanism, and then the careful observation of the effect of the drug in producing or modifying these symptoms. Before an intelligent investigation into the action of remedies in the sick human body is undertaken, a knowledge of symptoms is necessary.

## 5. The Importance of Symptoms in Research.

There is to-day a recognition that medical knowledge is greatly lacking in many essentials, and strenuous endeavours are made for the encouragement and prosecution of research. Where a clear conception of the problem is attainable, an orderly and well-planned investigation may result in a successful issue, as in the investigation of malaria and allied diseases and syphilis. An absence of a clear conception of how research should be pursued leads to a disorderly attack and a great waste of time and energy is bound to result. The vast majority of diseases which afflict a community in this country have not been clearly defined, so that any attempt to prevent or cure such disease is sure to lead to failure. It is therefore manifest, before we can attempt to deal effectively with the more common diseases, a knowledge is first required of the manner in which these diseases affect the human body. While the study of how a noxious agent which produces disease, such as a microbe, may behave in culture media or in animals may be necessary to the inquiry, yet a knowledge of how the noxious agent acts upon the human body is also necessary. As this knowledge can only be acquired by the study of the reactions produced in the body, the importance of symptoms is apparent.

A wider view of research must also be taken. As already indicated, diagnosis, prognosis, and treatment are essential to the practice of Medicine. Research in these subjects is urgently called for. Such research can only be undertaken by those who have the opportunity of seeing individuals in ill-health, so that an investigation of the symptoms of disease, carried out systematically and with a precision hitherto unattained, is urgently called for.

Investigators are recognising that they have only an experience limited to certain aspects of disease, and they find it necessary to associate themselves in bands or teams for the prosecution of research. Many of these teams include men

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profoundly informed in their particular branch, but there is one member essential to this work who is invariably absent—one with a knowledge of the symptoms of disease. The need of this type of investigator is recognised, and one with clinical experience is sometimes included in such a team, but medical knowledge has not yet advanced so far as to enable such an investigator to recognise that his knowledge of symptoms is so imperfect that he is unfitted for such work.

In the intelligent prosecution of medical research, therefore, a knowledge of symptoms is essential.

### 6. The Mechanism of a Disease Process.

It is necessary to hold clearly in mind what disease is, although it may not be possible to give a logical definition.

The term disease as commonly applied refers to a distinct condition or entity. When, for instance, a patient suffers from pain in the eyeball and lachrymation, and the conjunctiva is seen to be red and injected, we recognise that he suffers from a disease, or a diseased state. An examination by one doctor may fail to reveal any further facts, and he would call the disease conjunctivitis. Another doctor may recognise that the symptoms of photophobia, lachrymation, and injection of the capillaries are phenomena produced by a foreign body acting on certain tissues of the eye and may detect a speck of coal implanted on the cornea. This removal of the foreign body is followed by a disappearance of the phenomenon.

### 7. The Definition of Disease.

Here we have a clear example of what constitutes disease, and from such an instance disease can be defined, for practical purposes, as *a state induced by an agent acting injuriously on the tissues*. The speck of coal by itself is not a disease, nor is the lachrymation and other signs. When, however, the speck of coal produces these signs, the whole syndrome (agent and attendant phenomena) can be conveniently grouped under a definite term—disease.

When the ailments that affect the human body are carefully analysed it will be found that the vast majority conform to this definition of disease. The noxious agent may be a foreign body, a microbic infection, or a chemical agent, all of them innocuous whilst outside the body, but on their entrance into



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the body, as soon as they cause a reaction, a state of disease may be said to be produced.

In many people who suffer from ill-health the matter is much more complicated, but this is simply due to the fact that with the persistence and progress of the diseased state new reactions are set up until the number is so great that the original disturbance is lost sight of. Nevertheless, fundamentally the onset of ill-health was provoked in the manner described in the definition.

## 8. The Detection of Disease.

In the simple illustration of the foreign body in the eye, the noxious agent and its effect upon the tissues are readily seen and recognised, but the cause of ill-health in the vast majority of cases cannot be so readily found. The noxious agent is more subtle; its mode of entrance into the body is undetected and the original seat of disturbance obscure. As a rule there is no direct evidence of its nature, and seldom can a diagnosis be made, based on its detection.

While the agent which provokes the ill-health is therefore not recognisable, the phenomena or the symptoms it produces afford the clue by which it may be detected. These phenomena vary widely, but they depend in the main upon two factors:—

- (1) The nature of the noxious agent.
- (2) The tissue acted on.

It is scarcely necessary to elaborate this point. The agent may be, as already stated, a foreign body, a microbe, or a chemical agent, and it can be understood that the action of these different agents on the tissues would vary; while the tissues acted upon, as fibrous tissue, muscular tissue, nervous tissue, or secretory cells, would give reactions peculiar to their functions.

Direct detection of the noxious agent being often impossible, we are driven to seek for it by following up the clues afforded by the reaction of the different tissues, which in the human body we recognise as the signs and symptoms of disease.

## 9. The Definition of Symptoms.

Much consideration has been given to the definition of symptoms and signs of disease. In this article no distinction is made between them. The terms symptoms, signs, manifesta-

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tion, phenomena, are used interchangeably, and mean a *reaction of the tissues of the body to a noxious agent*.

### 10. Methods for Investigating Symptoms.

Recognising that symptoms are the reaction of the tissues of the body to a stimulus by an agent, for a due appreciation of their meaning certain of their features have to be clearly understood. A person in ill-health may present some readily detected sign, as pallor, or suffer from some sensation, as pain, and the custom has been, when the doctor has failed to find the causes of these symptoms, to diagnose the cases as anæmia and neuralgia. So long as such diagnoses satisfy, it is manifest no progress can be made. No doubt there is a difficulty in getting beyond this step, and medical science has not yet advanced so far as to recognise the method by which further knowledge can be acquired.

The first step to be taken is to find the mechanism by which symptoms are produced. No doubt many observers have attempted this study and a limited advance has been made. The state of the blood has been the subject of much inquiry, and a great many facts have been accumulated. Likewise, pain has been the subject of much study and again many facts have been accumulated, yet the results have led us on but a little way, and are scarcely commensurate with the time and energy spent on them. The reason for this comparative failure is that we do not yet understand the principles which should guide research in Medicine. If we take one of the commonest of symptoms, that of pain in disease of the viscera, and consider what information it is capable of yielding were it thoroughly investigated, we will understand some of the steps necessary to be taken for advancing our knowledge of disease.

Investigations have shown that the pain in disease of the viscera is referred to some portion of the external body-wall, frequently remote from the seat of disturbance. The mechanism by which this is brought about seems to be as follows. A stimulus of a particular kind arises in an organ produced by some noxious agent. This stimulus passes by a sympathetic nerve to its cell in the central nervous system. There the stimulus passes from the cell to other cells in its immediate neighbourhood, and these cells, when stimulated, react according to their function, a secretory cell modifying the secretion; a muscular cell giving rise to contraction in its muscle; a pain

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cell producing pain referred to the peripheral distribution of definite nerves in the external body-wall.

There is thus good reason for assuming that there is a relation, precise and definite, between the viscera and areas of the external body-wall, through the nervous system. When this relationship is better understood, it will then be possible to say, when a patient complains of a pain in a definite region, in which organ the disturbance is which produces the pain.

The next step will be to recognise what tissues of the organ are capable of giving rise to pain when stimulated. We do know that certain tissues may be subjected to much injury and destruction without pain, while other tissues readily cause pain when stimulated in a particular manner.

The last and most important step is to recognise the nature of the stimulus—it may be the noxious agent which is the cause of ill-health. We know that not all stimuli applied to an organ will give rise to pain. For instance, the cutting or tearing or burning of organs may occur and no sensation be elicited. Yet we do know that visceral disease is capable of giving rise to pain of all degrees of severity. Manifestly, then, it is only stimuli of a peculiar kind that are capable of producing pain.

Inquiry so far has revealed that there are probably but a few kinds of stimuli capable of producing pain, and that these can be differentiated in several ways—by the character and duration of the pain, by the conditions that tend to provoke it, and by the presence of other phenomena which have been provoked at the same time and by the same stimulus. It will be seen that this line of investigation holds out the expectation that pain and its associated phenomena may not only indicate (1) the site of the organ, but (2) the tissues disturbed, and (3) the nature of the agent producing it.

There is now sufficient evidence to show that specific agents on entrance into the body produce specific reactions. This is recognised in the case of the exanthemata, even though the agent has not been actually recognised in all cases. With a better understanding of the mechanism by which symptoms are produced, and by the detection and correlation of associated symptoms, and the careful study of the conditions found post mortem, or on the exposure of the viscera by operation, combined with bacteriological and other laboratory inquiry, the morbid state—provoking agent, and reactions—will be elucidated.



# FUNCTIONAL MENTAL ILLNESSES

THE MORRISON LECTURES, 1920.

By R. G. ROWS.

*(Continued from page 91.)*

## II.

The task before us in this lecture is to inquire whether there is any evidence to justify our assuming that other psychic processes, normal and abnormal, may be explained on similar lines, whether and to what extent conditioned reflexes, as they are termed, constitute the physiological mechanisms on which depend the ordinary activities of the human mind in health and disease.

In the course of my experience during the past few years, and especially in connection with the mental illnesses occasioned by the strain of the war, it has been interesting to note that many cases have been examined which bear a striking resemblance to the experiments described by Pavlov. Let me give you a few instances.

The first case was that of a man who passed into a state of terror on hearing the noise of a tin can falling. Now it is known that at the front during the war, a bell was rung in order to warn soldiers of the approach of a gas attack and no doubt it produced in them feelings of tension and fright. The men all knew of the terrible sufferings which might be caused by gas; some had seen others in torment and some had experienced a little of it themselves. But in other areas another warning was employed in place of the bell; no bell being at hand a tin can was beaten. It was found that this man, who had been warned of a gas attack by the beating of a tin can, fell into an emotional state while in hospital if he heard the noise produced by a tin can falling or by anything which resembled it.

The results in this case, therefore, are analogous to the results produced in the dogs by simple stimuli received through the auditory apparatus; it illustrates the differentiation of the character of the stimulus comparable to the differentiation of the pitch of the note by the dogs.

## Functional Mental Illnesses

Now let me refer to cases which are a little more complicated. The first case complained that he could ride in a bus or a train without discomfort but that he was thrown into a state of terror if he entered a tram ; another man, who was under my care at the same time, could travel in a train or a tram comfortably but was afraid to make a journey in a motor-bus. During the railway strike last year he asked to be excused from attending the Clinic while the strike lasted because in order to get there it would be necessary for him to enter a motor-bus and he did not feel he could do that.

Exploration of the case of tram-phobia revealed the cause of the disability. He was first asked whether he could think of any special feature connected with the tram which did not apply to a bus or train but which might account for the terror arising when he travelled in a tram. For a time he could not, but on being questioned as to whether there was any sound connected with a tram which did not exist in the bus or train he said immediately, "Oh! yes, sir, the sound of the little trolley-wheel on the wire." His history was that a shell had come over, broken in the dug-out in which he was seeking safety with a few other men and he had been buried and three of his companions killed. The sound of the trolley-wheel on the wire had resembled somewhat the sound of the shell, and as the shell progressed until it blew in his dug-out, so the sound of the trolley-wheel advanced with the tram-car in which he was sitting. The first attack occurred when he entered a tram in London soon after his return from France. He had entered the tram feeling fairly well, but in a very short time he was seized with terror and was obliged to get out. When he did so he was shaking all over, was sweating, had palpitation and all the manifestations of intense fear. Immediately after telling me that it was the sound of the little trolley-wheel which reminded him of the shell coming, he added that when he returned to his home from London he had been walking with a friend one evening and they had stopped at a tram-stage to await a tram which could take his friend home. Suddenly he gave a jump and commenced to shake all over. On being asked what was the matter he said, "Can't you hear it?"—"it" being the sound of the trolley-wheel on the wire as the tram approached from the distance.

In the case of the fear connected with entering a bus, the history was that after he had returned to England in a "nervy"

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condition he had been travelling in a motor-bus which, while going down-hill, had got out of control and dashed through the front of a house. From that time he had had a phobia connected with buses.

Another case of interest is that of a man who, during the singing of a hymn while attending divine service, suddenly commenced to shake, his legs gave way and he had to be carried out. At the next interview the cause of the onset of this acute emotional state was explored. At the service which was held in one of the rooms of the hospital, a piano was the instrument used to accompany the singing. Some days previously the patient had visited a picture-house at which a war film was shown. At the moment the explosion of a shell was thrown on the screen the pianist in the orchestra at the picture-house had thumped on a low note of the piano. The picture of the explosion of the shell as shown on the screen, to which was added a sound capable of reminding him of a shell explosion, had caused him to be emotional so that it was necessary for him to leave the picture-house. The striking of a low note on the piano during the singing of the hymn had reminded the patient of the thump of a low note when the picture of the shell explosion had been thrown on the screen, and this explosion on the screen had reminded him of the real shell explosion in France which had broken him down and had led to his mental illness.

Now it may be said that even though the causal influence—noise on tin can and the appearance of gas—in the first example was somewhat analogous to the process employed by Pavlov to produce a conditioned reflex, namely repetition of a definite stimulus—the ringing of a bell accompanied by the presentation of food—the others differed from it in that in two—the case of the dug-out being blown in and the accident while on the motor-bus—the result followed a single stimulus. In the last case the sound on the piano during the singing of the hymn resembled the thump on the piano at the picture-house when the shell explosion appeared on the screen, and that had revived the memory of the real shell explosion in France. In this case the steps in the process were more numerous and therefore the process was more complicated.

It will therefore be necessary to consider whether there are any mechanisms which could provide for the development of a conditioned reflex in them also. In order to arrive at any



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explanation it will be essential to consider some of the mechanisms concerned with ordinary mental activity.

It is now recognised that with every stimulus which crosses the threshold of consciousness the intellectual recognition of the stimulus is always accompanied by a feeling tone. Bianchi, in the work previously referred to, suggested that the simplest and most fundamental feeling tones are probably the feelings of "well-being" and "ill-being" of the organism, and he referred to the complex states, which we commonly refer to as the emotions, as further developments from these. Monakow, in speaking of the development of speech in the child, states that already in the earliest weeks of life coarse expressions of affects (cries, noises, facial expressions, affect speech) run parallel with nutritional needs. Such affective means of expression remain preserved in the adult, though later they may undergo modifications, steps of differentiation. But when the adult needs similar movements of expression these are carried out by means of nervous processes which were acquired in earliest childhood. The differentiation must depend on the various experiences lived through in the course of development when, according to Monakow, the perceptive activity becomes more pronounced and the different sense organs acted on by external and internal stimuli, co-operate in the development of the more complex processes. Such combinations of stimuli, with their associated affective tones, are stored up in memory. Bianchi has suggested that each stimulus received is transmitted upwards to higher centres, where it comes into contact with the memory-pictures of other stimuli of a more or less similar nature previously received which have left their imprint on the nervous mechanisms. It is, therefore, not stored up as an isolated memory-picture but by association it becomes linked up with the imprints of the earlier analogous stimuli and falls into its proper niche. When recalled it does not appear in its original form, but in a form modified more or less by those memory-pictures with which it has become associated. Such memory can be reawakened by any suitable external phenomenon which arrives through the extero-ceptive paths of Sherrington or the "analysers" of Pavlov, or its appearance may be the result of internal stimuli, thought, memories or feelings and also the appreciation of time or space.

From our own experience we know that when any memory

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is recalled into consciousness there is always reawakened an emotion similar to that which appeared at the time the original stimulus was received. As Försterling has said, "a sensory stimulus which acquires a psychic quality at the moment of perception brings with it not only an intellectual addition but also another quality—a feeling tone; and as a perception is laid down as a memory-picture, so is its feeling tone always in close touch with its memory-picture and when this is revived, whether through a fresh stimulus or an antecedent memory-picture, its feeling tone will be awakened at the same time."

In the cases under consideration, repetition of the memory of the incident, which caused terror at the time of the blowing in of the dug-out, led to the laying down of a path which gradually became more and more facile to stimuli, perhaps of slight degree of intensity but capable of awakening the memory; and when the memory was recalled the emotional state, which is specific in every instance, also reappeared. A habit of mind developed, caused by repetition, as all habits or automatic reactions are produced, and a very slight stimulus was required to give rise to reaction. In the tram-stimulus case it required only a sound, somewhat similar to the sound of the shell which caused the injury; and in the bus-stimulus case a position similar to that occupied at the time of the original fright was sufficient to send the patient into a state of terror. The subjects did not stay to think that they were in England, hundreds of miles from the scene of the accident, and that years had passed since it occurred. The similarity of sound, combined with the fact that when the tram went forward the sound advanced with it continuously, was sufficient stimulus to revive the memory of the destruction of the dug-out together with the emotion of terror. The second did not recognise that he had ridden hundreds of times on buses without accident; his occupying a similar position on a bus was sufficient to reawaken the memory of the accident and its accompanying feeling tone.

After having explained to the man with the tram-phobia the nature of the mental processes concerned and the mechanisms by which they were carried out, I asked him when he left me to go at once and get on a tram. He was very doubtful whether he could do this, but he said, "As you have asked me to do it, sir, I will try." I advised him to look at the trolley-wheel and to

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say to it, "I know of what the noise you make will remind me, but the blowing in of the dug-out by the shell happened years ago, and hundreds of miles from here. Now I am in Birmingham and you are the trolly-wheel of a tram, and the shell incident is now only a memory." He carried out my instructions and at the next interview he told me he had a slight headache at the end of the journey but there had been no feeling of terror. He came from his home for the following interview by tram and without any discomfort whatever.

The man with the motor-bus-phobia was dealt with in a similar manner, and he travelled twelve miles by motor-bus for the next interview. He had an occasional feeling that the driver travelled rather fast around some corners but he suffered no further disturbance.

An explanation of mental mechanisms and an exploration into the specific incident which formed the basis of their illness did enable these men, as it has enabled so many others, to overcome the emotional outbursts which formed the basis of their illness.

But it is not necessary that the memory of the original incident should come into consciousness. To illustrate the appearance of the emotional disturbance without the original incident being perceived at the time, I may mention a case of a man who had a very serious illness and who for years after he had recovered, if he were alone and unoccupied during the hours from four to six in the afternoon, was seized with an extreme feeling of misery, which made everything, past, present, and future, appear black. Exploration revealed that during the illness the hours during which he felt worst, physically and in every way, were the hours from four to six in the afternoon. The result of the exploration and explanation has been that the trouble has rarely recurred.

The day after this history was conveyed to me I related it, much as I have done here, to a patient in an asylum who had suffered from an acute attack of melancholia which was followed by a slight state of mania. On asking what it conveyed to her mind, she said, "I was trying to commit suicide from midnight until 4 A.M." Up to this time she had got restless at midnight, left her bed, wandered about the ward, refused to return to bed until 4 A.M., and then she returned and slept. I asked her to send me a note the morning after the interview to tell me how she had slept and the note was: "Slept well, thank you";



there was no more trouble in regard to her sleeping. Later during the war another case illustrating this point was that of an officer whose sleep was much disturbed from midnight onwards and who had been receiving large quantities of hypnotic drugs. The drugs produced little beneficial result, and as his restlessness appeared so near midnight on successive nights the two cases just detailed were told to him and an exploration into the causes of his insomnia and misery was commenced. Memories of incidents of a terrorising and depressing nature were unearthed and on only two or three occasions did he subsequently require hypnotics.

Two other interesting cases may be mentioned. One is that of a man who was troubled by the recurrence of the number "13," which caused him intense anguish, and he became so miserable that the idea of suicide suggested itself to him. This dread of "13" influenced him to such a degree that the thirteenth step in a flight of stairs impressed him and he would jump it or sometimes stumble over it. But the number "13" was suggested to him in many other ways. On one occasion he said, "Why is this idea of '13' always being put into my mind?" I replied, "Bother the idea." He said immediately, "There you are—there are thirteen letters in that phrase and you are putting the idea into my mind." On asking him for other phrases which had upset him he said: "So many people say to me, 'Good afternoon'; there are thirteen letters there, and also in the phrases, 'How did you know?' 'What do you want?'" One day he asked me to grant him an interview. I said "Yes, quarter-to-four." He pointed out that "quarter-to-four" contained thirteen letters. He added, "I never do anything on the 13th day of the month or on the 27th. There are thirteen letters in 'twenty-seventh.'" He had great difficulty in bringing himself to come for an interview on one occasion because it was the 27th of the month. Dr T. A. Ross, under whose care he was, has informed me that as a boy the patient was impressed with the notion that the number "13" was an unlucky number by a servant girl who in his thirteenth year had behaved immodestly towards him. In subsequent years many misfortunes befell him and gradually the significance of "13" became an obsession with him and dominated his life to a great extent.

Another case was connected with the number "17." This referred to an incident in the patient's experience which he said

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had spoiled his life. He was in a colony and received a letter from a girl informing him that she was pregnant by him. He went to her and married her but left her the same day and has never lived with her. A daughter was born, and he provided for mother and child and has kept them in comfortable circumstances. One day, while walking in a village near the hospital, he felt depressed and experienced such an impulse to utter the number "17" that he could not refrain, and as he walked along he said aloud, "seventeen, seventeen." This frightened him very much, especially as at the time the mental disturbance from which he suffered was acute; he feared this meant his advancing well beyond the border-line. On exploration it was after much difficulty discovered that he recently had received a letter telling him either that his daughter was seventeen or had just entered her seventeenth year—he could not remember which it was and he had lost the letter. I asked him to write to his wife and inquire. He did so, and found that it was just seventeen years since the incident had occurred. After explaining matters to him, I asked him to go to the village and follow the same walk. Naturally the number "17" entered his mind but he felt no impulse to utter it.

It will be seen in some of these cases that, although the illnesses commenced after a period of war service which may be looked on as the exciting cause, their main origin must be sought in incidents which occurred in their pre-war life. Their powers of resistance or of control had been weakened by the strain of war or by some accident and the way had thus been prepared for the memory of the pre-war incident to exert its influence. No new mental mechanism was brought into play to cause the disability; all that was required was a disturbance of the already existing mechanisms. And if similar illnesses amongst the civilian population are analysed they will be found to be due to analogous causes, that is causes similar in kind but differing in degree, and that in them also like mechanisms are affected.

To give you one or two instances which have arisen independently of the war, let me mention the case of a woman who complained that she was suffering intense pain in the abdomen, that it was torture day and night, that she could not sleep, and had decided that life as it was was not worth having. She had had two or three operations for internal trouble but nothing physical was found during the mental

disturbance to account for the pain and there was no special tenderness on palpation of the abdomen. Every little flatulence, any odd sensation in the abdomen, was made use of to confirm her idea of torture. She pretended anger because no drugs were given, and, as she said, nothing was being done. It was suggested to her that she was concentrating her attention on the pain—and of course she could sympathise with herself in this—in order to escape from some mental anxiety. In the first interviews little progress was made, but after a time she commenced to talk of her past life and to reveal incidents regarding her father, her husband and herself which had caused her grave anxiety. In the middle of one of these interviews she said, "Is it not strange? Since I have been talking to you about these things I have had very little pain in my stomach?" and during the following evening she talked to the nurse on general subjects, and on her piano-playing, on music and on painting in which she was also proficient, referring only once or twice to the pain.

Another woman, soon after the commencement of the first interview, interrupted by saying, "I must have a baby." This remark, which at first seemed somewhat peculiar, was explained by further exploration. During this it was discovered that it was not to be taken as a mere sexual expression but that a long series of troubles lay behind it. Amongst these may be mentioned:—

(1) An unhappy girlhood due to her father's temper and his neglect of her mother, which led to frequent quarrels.

(2) The fact that she felt that she had married the wrong man. The man whom she did marry set his business before her and neglected her; the thought of "what might have been" intruded but was felt to be extremely wicked.

(3) The death of her favourite brother on her wedding-day.

(4) The death of two children and the fact that the third showed a great attachment for the father and an aversion for her.

(5) The mental breakdown and suicide of her mother.

(6) The mental breakdown of her sister and her removal to an asylum.

(7) The dread that she must follow in the footsteps of her mother and sister.

Her desire to have a baby was due to her desire to have a child in whom she could interest herself so that these past



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troubles should not dominate her mind to such an extent. She was benefited by her talking over her life and by having mental mechanisms explained to her; she began to look at her sad experiences and her dread of mental illness from a different point of view. In a letter she said, "I am better because my head has not been bad for five weeks; it is so nice to be free from that awful pain"; and in a later interview she repeated that if she could have another child she could occupy herself with it and find much relief in attending to it. Consider for a moment with what frequency must this patient have been reminded of her misery. Her home, her husband, her child, the appreciation of the happiness of others, thoughts and memories of her mother and sister, in fact there seemed to be no end to the stimuli which could set her mental mechanisms working along the facilitated path leading to misery, and the impulse of these stimuli was so strong that the other mechanisms were inhibited, her mental field was extremely narrowed and as a natural result she was convinced that life, as it was, was not worth having.

Then there may be mentioned another case who had become hypochondriacal. He complained of his stomach, his chest, his heart, his breathing, and was also generally irritable and depressed. When improving he said at one interview: "I exaggerated my physical ailments." When asked why he did so, he replied, "I was more satisfied if I felt there was something wrong—incurable." From the remark made by the last case it is evident that he deliberately directed his mind to some physical cause in order that he might escape the torment of his memories. This is a process known to many of us who may not have suffered from a serious mental breakdown and it may be considered a natural effort to adapt oneself to the environment.

Now in the cases of the two women just referred to, were they not applying a stimulus, the one a physical-pain stimulus, the other a mental-pain stimulus based on the disappointment of her desire and therefore containing both physical and psychic factors, in order to escape from the depressing mental states connected with incidents in their past lives? Each was employing a stimulus which would allow her to sympathise with herself, to replace a series of psychic stimuli, accompanied by distressing emotions which could not be endured.

In all these cases which have been mentioned we have found

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emotional states aroused by stimuli of various kinds, sound, time, accident, pain, daily surroundings, memories and thoughts. Is it possible that these may be regarded as stimuli which by repetition have acted much as did the various stimuli applied by Pavlov which led to the development of a series of conditioned reflexes? In the case of the dogs, every stimulus, whether of sound, light, electric current or time, was associated with the presentation of food and this experience was stored up in memory together with its appropriate feeling-tone. Each subsequent application of the stimulus must have revived this memory with the feeling-tone until at last a nervous mechanism was established which allowed the stimulus to take the place of the presentation of food and was followed by the secretion of saliva. A conditioned reflex was gradually developed between the stimuli, sound, light, electric current or time and the secretion of saliva.

Now in the cases I have laid before you I beg to suggest that a somewhat similar process has taken place. The original stimulus was perceived and was accompanied by its appropriate feeling-tone; the stimulus and the reaction produced by it were imprinted in memory.

In the case of the tin-can stimulus the conditions resembled more or less closely the experiments of Pavlov on the dogs. Here again we must assume that the memory of the original experience and its feeling-tone were revived repeatedly by subsequent similar stimuli and a nervous mechanism was gradually established which could be put into action by sounds somewhat resembling in character the original stimulus.

The tram-stimulus and the motor-bus-stimulus were rendered effective through the mechanism of association by resemblance, so that the memory of the original stimulus and its feeling-tone were revived. And with the control weakened this was so intense in the tram-stimulus case that, when seized with terror in the tram, he saw in front of him a picture of the tram falling to pieces, the glass scattered around and he himself lying in the midst of the wreckage; that is he had an acute hallucination which undoubtedly was based on the memory of his dug-out being blown in and his being buried.

May we not assume a similar mechanism at work also in the cases of the 13-stimulus, the 17-stimulus, and in the two women. In the case of the woman who said "I must have a baby," the germs of her breakdown when about 45 years of

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age were laid while she was a child through her father's behaviour and his quarrels with her mother. Misery arose in the child and subsequently many other experiences of a painful nature made use of the common path through which she experienced the misery.

It is an experience common to all of us that if we find ourselves in an emotional state from some special cause, any other causes, stored up in memory, which have previously given rise to a similar emotional condition, will make use of the opportunity to assert themselves; that is, that the threshold of the nervous mechanism which leads towards the common path for the expression of an emotional state (for example misery), is lowered, and the way is opened for any stimulus in the form of a memory of other past experiences for which this mechanism is adapted. But instead of the reaction being produced by one specific stimulus, such as sound, light, electric current or time, that is by external stimuli, it is in these cases due to internal stimuli also, to thoughts, memories, or to anything capable of awakening the memories by means of the process of association.

Pavlov stated that the more complex conditioned reflexes depended on various complicated combinations being established in which psychic factors played an important part; but he added that the distinction between the one and the other was one of degree rather than one of kind. The problem for us to consider is whether in these exceedingly complex conditions in the human subject we are dealing with conditioned reflexes and whether the distinction is not again one of degree rather than one of kind.

*(To be continued.)*



## CLINICAL RECORD

### CASE OF RETRO-PERITONEAL FIBRO-MYOMATOUS TUMOUR OF UTERUS.

By F. D. CAIRNS, M.B., F.R.C.S.E., Gibraltar.

CASE.—The patient, Ana Abedas, Spanish, age 24, ii.-para, was admitted on account of an abdominal swelling. She stated that she was delivered of a full-time living child on 26th August 1918, and that subsequent to the delivery, her abdomen had remained abnormally large. Prior to her pregnancy, she had no knowledge of a swelling in her abdomen, but whilst carrying the baby, she was so unusually big that she believed herself to be carrying twins.

The parturition was a remarkably easy one, lasting but two hours, and was conducted by a midwife. Persistence of a swelling, subsequent to the parturition, was noted at this time, but as it produced no complications in a normal puerperium, the cause was not investigated. Since then it had gradually grown larger, and in the last two months appreciably heavier. She had become unable to do her housework because of its weight, and her easily induced sense of fatigue. During the day she had no dyspnoea, but in the recumbent position had frequent difficulty in breathing. Her appetite remained good, and she had no symptoms of indigestion. The bowels were inclined to be constipated, but not more than previously. She had frequency of micturition. Her menstrual history showed no departure from the normal; it lasted four to five days, and was not attended by pain.

Pain in the swelling only appeared during the last few weeks, and was situated in the right iliac region.

The patient was a small spare woman presenting an enormous swelling in her abdomen. The tumour extended apparently throughout the entire abdominal cavity, everywhere giving a dull note on percussion. The skin over it was thinned and stretched, and so also was the whole thickness of the abdominal wall, which felt the thickness of a sheet of stout paper, and moved easily over the swelling.

*Per vaginam* the cervix was found high up and pointing backwards. The body of the uterus could not be identified, and the solid swelling could be felt occupying both lateral fornices and broad ligaments.

The urine was normal in amount and showed no albumen. The heart and lungs were free from disease.

*Operation.*—The operation was performed on 11th May 1920. A right paramedial incision was made below the umbilicus, and the

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abdomen was entered without difficulty, through the stretched and atrophied abdominal wall. The hand inserted into the abdomen confirmed the anticipated size of the tumour. It extended up under the costal arches, and above its summit, cramped into small space beneath the diaphragm, were the stomach, coils of small intestine, omentum and transverse colon. It stretched from side to side of the abdomen, and occupied both sides of the pelvis, reducing the pouch of Douglas to a potential slit.

In its entire extent it was covered by glistening peritoneum, and across the surface in its lower half ran the Fallopian tubes and ovarian vessels, leading to a cystic ovary on the right side, and an apparently healthy ovary on the left.

In the middle line the Fallopian tubes converged on the uterus, slightly elongated but not deformed, resting in a bed of tumour as it passed from one broad ligament to the other. The bladder was identified lying low down, and apparently not pulled up to the same degree as the uterus.

The uterine arteries could not be seen at this stage, and apparently lay on the inferior aspect of the tumour.

The ureters were not visible. The expansion of the right broad ligament was carried on to the pelvic wall, where the peritoneum was stripped up so that the cæcum and part of the ascending colon rode on the surface of the tumour. There were also a few peritoneal adhesions between the bowel and the tumour at this point, which probably accounted for her pain.

From the anterior position of the ovary and its vessels it appeared as if upward progress of the growth had been effected by expansion of the posterior layer of the broad ligament, which ultimately came to be the covering of the summit of the growth.

Expansion had also taken place across the middle line behind the uterus, which lay, apparently unattached on its surface to the left broad ligament, where growth had continued and coincident expansion of that structure. These findings determined, that any attempt to remove the growth must be accompanied by hysterectomy, in order to deal satisfactorily with its blood supply.

The operative steps were as follows:—A transverse incision was made through the peritoneum across the anterior surface of the tumour, and the peritoneum was separated upwards and downwards. The process progressed easily, and ultimately the upper half of the tumour was enucleated from its coverings, and the cæcum released from its surface.

Forceps pushed through the peritoneum were closed over the left Fallopian tube, and the vessels medial to the ovary and these structures divided.

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A transverse incision was then made across the body of the uterus, and the peritoneal flap reflected downwards.

The left uterine vessels were identified and were clamped close to the internal os.

The body of the uterus was now cut across at this level from left to right, revealing at the end of the cut the right uterine vessels running beneath the tumour.

By blunt dissection the growth in the right broad ligament was easily separated from its connections till finally it only remained tethered by the much expanded and sessile right ovario-pelvic ligament. The peritoneum of this ligament was opened, the ovarian vessels secured by open dissection clamped and divided.

The tumour was now free except for some odd peritoneal attachments where incision of the capsule had not been completed. These having been divided it was removed.

Following its removal the abdomen had an unusual appearance, the bulk of the intestines being still hidden up under the ribs, and its sole constituents seemed to be the cæcum, and the sigmoid flexure with aorta pulsating posteriorly. The completion of the operation presented no difficulties, except for some bleeding above the pelvic brim on the right side. This was ultimately controlled, and the floor of the pelvis re-covered with peritoneum of which a considerable surplus had to be removed.

The abdominal wall was sutured in layers with catgut, and the skin with silkworm gut. The patient stood her  $1\frac{1}{2}$  hours anaesthesia admirably, and apparently did not suffer shock from the loss of so considerable a supply of blood as the tumour contained, nor from the fall of pressure which followed the removal of so dominant a constituent of her abdomen.

Her convalescence was uneventful. The stitches were removed on the 10th day; she was up on the 14th, and on the 21st returned to her home, the wound being firmly healed. After removal the tumour showed the following characters:—It weighed 28 lbs. It was roughly globular in shape, and from its posterior surface projected a subsidiary lobe, separated from the main body by a deep sulcus. Here and there areas were still covered by peritoneum which was surplus to the needs of the abdomen, whilst in the main it presented a rough surface showing bundles of tissue running irregularly, and interlacing with one another. Large thin-walled veins, some half-inch in diameter, crossed freely beneath the peritoneal investment. To touch, it was soft everywhere, and suggested a degree of cystic formation.

On its anterior aspect were the uterus, right Fallopian tube, and right ovary (cystic). On the left side was the stump of the left



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Fallopian tube. The cavity of the uterus was 4 inches long, but apart from its increase in length, neither as regards its walls, nor its mucous membrane, was there any sign of departure from the normal. By loose dissection it could be raised from the bed of tissue in which it lay.

This ability to separate it was not absolute, however, for on the post-uterine wall, and below the uterine peritoneal investment, there was a small area, not larger than quarter of an inch square, which showed more intimate connection between the muscular fibres of the uterus on the one hand and the tissue of the tumour on the other. Section of the tumour showed it to be solid throughout, the softness to touch being explained by an œdematous condition of its constituent elements. It was white in colour except along the septum which intersected its surface, and there, increased vascularity gave a coloured complexion.

The substance of the tumour consisted of loosely set whorls of tissue running irregularly, after the manner of fibro-adenomatous growths. No microscopic section was made.

*Diagnosis.*—At first the tumour was believed to be a pure broad ligament tumour arising from the myomatous elements that are to be found in the broad ligament, but the subsequent discovery of a small area on the back of the uterus in more intimate contact with the tumour than the rest of the uterus, raised the possibility of its being a retro-peritoneal uterine fibroid tumour, whose manner of growth and development had given it the clinical character of a broad ligament tumour occupying both broad ligaments.

Apart from the pathological interest of the origin of this neoplasm, there is also the interest inherent in the easy parturition eighteen months before its removal. The history indicates that the tumour was existent at this date, and was of a size easily appreciable to the lay observer. Whatever its subsequent increase in size, it must even at this time have been a large tumour occupying the pelvic cavity, and according to all anticipation should have materially affected the course of labour. That this was not the case must be attributed to the looseness of its texture allowing it to be compressed into small bulk, and that remarkable faculty for easy child-birth which seems to be the fortunate possession of some women.

## CRITICAL REVIEW

### SYPHILIS: ITS EARLY DIAGNOSIS AND INITIAL TREATMENT.

By DAVID LEES, D.S.O., M.B., F.R.C.S.E., Lecturer on Venereal Diseases, University of Edinburgh.

DURING the last five or six years venereal diseases have become more widespread, if they have not actually increased in incidence. In view of this and of the undoubted effect which syphilis, especially, has on the general health, not only of the individual but also of the community, its prevention, early diagnosis, and effective treatment become matters of supreme importance in preventive medicine.

It is well known that in any disease due to micro-organismal infection the earlier the disease is detected the more effective can be the treatment and the eradication of the disease. Of syphilis this axiom is more true than of any other infection.

The discovery by Schaudinn in 1905 of the *Spirochæta pallida* as the casual organism of syphilis, and the application of the Bordet-Gengou or complement fixation reaction to the sera of syphilitic patients in 1906 by Wassermann, have added much to our knowledge of this disease in its earlier stages. The early diagnosis no longer rests solely on clinical knowledge in detecting specific ulcers and rashes, but can be made at a much earlier stage, when clinical data are indefinite and unreliable. There are three main methods available for early diagnosis of syphilitic infection:—(1) Detection of the *Spirochæta pallida* by microscope; (2) clinical observation, including the incubation period; (3) Wassermann test.

There may be difference of opinion as to the relative importance of these, but practically all workers are agreed that the Wassermann test is of least importance in the early stages. The examination for the *Spirochæta pallida* is applicable to all cases in which there is a surface lesion, and it is often of value in lesions which clinically look non-syphilitic.

**Microscopic Examination of Exudate from Sore.**—Every venereal sore should be considered a potential syphilitic sore, and bacteriological examination of the serum expressed from it made two or three times successively, either by the dark field or by staining methods, before any antiseptic treatment is applied. This method of examination is essential in the detection of specific infection of a scabetic run or herpetic vesicle, or of any lesion on the genitals which has not assumed a definitely specific character. *Spirochæta pallida* can be demonstrated in such lesions before the clinical manifestations have become definite, and such lesions often do not show the characteristic induration of a Hunterian chancre. The important

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points in the taking of the specimen for examination are (1) to avoid the use of antiseptics prior to taking the specimen, (2) to cleanse the sore with saline, and (3) to express the serum from the edge of the sore near its border and have the specimen as free from blood as possible. This can be done by exercising continuous pressure on the ulcer during the process of taking the specimen.

The equipment for examining by the dark ground field is not always available to every medical man, but there is no reason why the serum should not be collected in a capillary tube and sent for examination to a suitable laboratory, or short of this, stained by Giemsa's, Leishmann's, or Fontana's stain. Staining methods are not so rapid or so accurate from a diagnostic point of view, as they do not show the characteristic movements and the distinctive coloration of the *Spirochæta pallida*.

In the majority of the continental and American schools examination by dark ground is the first principle of diagnosis in early suspected genital lesions, and in St Mary's Hospital, Detroit, in cases where the prepuce cannot be retracted to enable the dark field examination to be done, Keane<sup>1</sup> circumcises and demonstrates the spirochæta from the excised portion by cultural methods in two to three days.

A simpler method than this in such cases is to slit up the prepuce dorsally, or resect a V-shaped piece from it, expose the suspected sore, and examine the serum expressed from it for *Spirochæta pallida*.

In cases in which the sore has been healed by the application of antiseptics, Mills' method of gland puncture by a fine hypodermic needle is valuable, and spirochætes can often be demonstrated in the serum drawn from the glands draining the area of the original sore.

While the method of dark ground examination is primarily applicable to the early stages of syphilis, it is also of value in differentiating secondary lesions from other skin conditions which they may simulate, as every untreated syphilitic papule or pustule, every mucous patch or condyloma, will show the specific organism.

**Clinical Evidence.**—The vital importance of any genital sore is the possibility of its being syphilitic. Once it is proved to be non-syphilitic it becomes relatively unimportant, and the terms syphilitic and non-syphilitic are preferable to the loosely applied term chancroid or soft sore. There has been a tendency of late years to neglect the clinical manifestations and appearance of a chancre and to rely on laboratory evidence, especially the Wassermann test. This is fatal to the patient as the time to diagnose a syphilitic lesion, if we are to cure the syphilis quickly, is in the early stages when the Wassermann test is still negative, when the disease is still localised, and when the patient can with confidence be assured that we can prevent it from ever becoming generalised.



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There is no outstanding feature of a genital sore, either its singleness, its definite margin, or its induration, which is not subject to fallacy, but a sore or series of sores which shows any or all of these characteristics and is surrounded by an areola, is strong presumptive evidence of syphilitic infection, and additionally so if the superficial lymph glands draining the area are palpably and painlessly enlarged and have a feeling like solid india-rubber.

Mixed infection superadded to the syphilitic focus will alter the clinical appearances of both the floor, edge, and surrounding tissues, and may at times alter even the feeling of induration which is so strong presumptive evidence of syphilis. The same condition will rapidly change a syphilitic gland into a suppurating bubo.

Generally speaking, the earlier the lesion is seen the less does it present the true characteristics of a Hunterian chancre. It is these early lesions that are so often missed if one relies on clinical data alone and which lend themselves to accurate diagnosis, if, combined with clinical examination, one examines microscopically the serum expressed from the lesion. Only by the combination of the two methods in every case can the diagnosis be with certainty established while the disease is as yet localised and curable.

**Wassermann Test.**—In the diagnosis of early syphilis the value of this test is very limited and is in direct proportion to the age and duration of the sore. In the earliest stages it is invariably negative and as such of no value in diagnosis.

In the later periods it is of more value and just before the onset of the secondary eruption it is positive in practically 100 per cent. of cases. The disease, however, should in all cases be recognised clinically and pathologically and be under treatment long before the appearance of a positive Wassermann test; and if a lesion is seen and the patient has a negative Wassermann test, and even if spirochaetes have not been demonstrated, if the clinical evidence points to its being syphilitic, it is not the ideal thing to wait till the test is positive before starting treatment by anti-syphilitic drugs.

The ideal one wishes to aim at is to train every student and every practitioner that the methods of diagnosing early syphilis are the dark field and clinical appearances combined. Antiseptics and cauterising agents make this difficult and should be abolished from our therapy until a definite diagnosis is made. Their use masks the symptoms and does not cure the disease, and is comparable to the use of opiates in acute abdominal conditions prior to diagnosis. At the present moment the early diagnosis of syphilis is an unknown quantity to many practising medicine, and one cannot insist too strongly or too often that waiting for the appearance of secondary symptoms is almost criminal, and that by so doing one loses the psychological

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moment in the history of the disease and the one and only time that, if taken advantage of, will lead to certain success and radical cure. In the later stages of the syphilitic process when the disease has become constitutional, the Wassermann test possesses a high diagnostic value. The Medical Research Committee,<sup>2</sup> after sifting all the evidence, state that: "A positive reaction is indicative of syphilis with exceedingly few exceptions," and that "the test may for all practical purposes be looked on as specific." A single test with negative reaction is of no value in excluding syphilis, especially in the presence of suspicious lesions and in the tertiary stage. It is only when a negative reaction is obtained repeatedly over a fairly long period, or after a provocative injection of salvarsan or one of its substitutes, that it can be considered as good evidence of the absence of the disease.

**Local Treatment of the Lesion.**—Fournier wisely pointed out that the treatment of a syphilitic lesion and of syphilis are entirely different things. In the pre-diagnostic stage two dressings only are justifiable, normal saline and sulphur. The application of any strong antiseptic at this period renders the finding of the *Spirochæta pallida* more difficult, and the healing up of the surface of the initial lesion only puts off the evil day. Saline fomentations tend to draw serum to the surface and cleanse the ulcer, while sulphur in powder form cleanses the wound and has a beneficent action on any septic process, while it does not prevent the demonstration of the organism in the lesion. Subsequent to diagnosis any antiseptic may be used, and equal parts of calomel and calamine powder well rubbed in is as valuable as any. In American clinics the vogue at present is to excise the sore as soon as a diagnosis is made, or short of this to cauterise it with a view to doing as much as possible to eradicate the original focus of infection. There are few lesions, however, which do not react quickly to arsenical therapy, and excision or cauterisation is seldom required in cases diagnosed early. In those lesions in which induration is very marked and is in a position where it cannot well be excised, the local injection of 10 c.c. of hectine or of 1 to 2 c.c. of the patient's salvarsanised blood serum daily will quickly reduce the induration and heal up the lesion.

**General Treatment.**—In the treatment of syphilis there are three standard remedies:—(1) Salvarsan, or its substitutes; (2) Mercury; (3) Iodides.

Salvarsan alone will abort and effect an absolute cure in many cases, especially in those diagnosed early. Magian,<sup>3</sup> in March 1918, inoculated himself with the exudate from a syphilitic sore containing numerous spirochætes, and had administered to himself one hour later 0.6 grm. of arsenobillon. No clinical signs of syphilis followed, and his Wassermann test taken at intervals of a month for eleven months remained negative. His contention as to the value of abortive

treatment has been supported by Fournier and Guenot,<sup>4</sup> who gave six injections of one of the arsenical remedies at weekly intervals to forty persons who had recent intercourse with patients showing florid contagious syphilitic lesions. No signs of syphilis appeared in any of the persons so treated, and the Wassermann tests repeated at intervals for over a year remained negative in all the series. Darier, Balzer, and Thibierge,<sup>5</sup> while agreeing with the results of Magian's experiment, do not agree with Brocq that it is justifiable to give intravenous arsenical remedies, with the object of aborting probable or possible infection, to persons who have exposed themselves to syphilitic contagion.

While it is generally agreed that salvarsan or its substitutes will clear up the outward manifestations of syphilis, there are few syphilologists who do not recognise the value and necessity of mercury in both early and late manifestations of the disease.

Fildes and Parnell<sup>6</sup> reported a series of 345 cases treated solely with novarsenobillon; but the cases were not followed up for a sufficiently long period to make the claim of cure a reliable one, and of the series only 44, or 19 per cent., are known to have had a negative Wassermann test for periods of a year or over. Their results were better the earlier the treatment was commenced, but are not weighty enough evidence to justify the exclusion of mercury from the active treatment of even early syphilis.

Hoffmann<sup>7</sup> emphasises the importance of combining mercury with arsenic with a view to complete sterilisation. He regards salvarsan and its substitutes used alone as dangerous on account of neuro-relapses, and states that by combined treatment they can be avoided and the patient sterilised in all sero-negative cases and often in sero-positive cases of primary syphilis.

In military hospitals during the war both drugs were given in all cases of syphilis and treatment was regulated as far as possible, a minimum dosage over a certain period being recommended, but no definite standard laid down of how many injections each patient should have. An ideal treatment was aimed at rather than a standard treatment as, strictly speaking, there can be no standard treatment for syphilis, and one must treat the individual till he is cured. The drugs to be used were standardised, and unless contra-indicated both arsenic and mercury were given simultaneously during the first and subsequent courses and mercury alone, with or without iodides, given during the intermediate periods.

The important point in the therapy is the total amount of arsenic which may be safely given to a patient in an intensive course during a fixed time, and this was found to be from 2 to 2.5 grms. of original salvarsan, or from 4 to 4.2 grms. of neo-salvarsan or their substitutes in eight weeks. Dosage beyond this was apt to be followed



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by signs of intolerance and side effects such as jaundice and dermatitis. Harrison<sup>8</sup> from his large experience of cases has laid down the following course as a minimum intensive course of treatment for primary cases :—

Day of Treatment.	"606" or "914"		"Hg."
	Grammes	Grammes	Grains
1st . . . . .	.3	.45	I
8th . . . . .	.3	.45	I
15th . . . . .	.3	.6	I
22nd . . . . .	...	...	I
29th . . . . .	.4	.6	I
36th . . . . .	.4	.6	I
43rd . . . . .	...	...	...
50th . . . . .	.4	.6	I
57th . . . . .	.5	.75	I

If Wassermann is still positive he gives a follow up course of :—

Day of Treatment.	"606" or "914"		"Hg."
	Grammes	Grammes	Grains
78th . . . . .	.3	.45	I
85th . . . . .	.4	.6	I
95th . . . . .	.4	.6	I
102nd . . . . .	.5	.75	I

Such a course has been followed by very satisfactory and lasting results in a large series of primary cases both sero-negative and sero-positive. Bolam is of opinion that any increase beyond these amounts gives rise to a certain amount of jaundice and dermatitis, especially at certain periods of the year, and prefers to lengthen the intervals of administration of the drug during the latter part of the course and gives it fortnightly after the fifth injection. Sequira has found that the initial hope of sterilising a patient by big dosage is futile, and now prefers to decrease the amount given weekly, to increase the number of doses, and lengthen out the period of treatment. He administers initially four weekly injections, totalling 3.35 grms. of novarsenobillon, and simultaneously 4 grs. of mercury intramuscularly. This is succeeded by a month's rest from arsenical therapy, and two months later the Wassermann test is done. Three further injections are then given, totalling 2.4 grms. of novarsenobillon in three weeks and eight intramuscular injections of mercury 1 gr., at weekly intervals. Scott and Pearson<sup>9</sup> advise three injections, totalling 1.2 grms. of "606" during the first three weeks and eight injections of mercury intramuscularly in doses of 1 gr., and potassium iodide with it. They rest the patient during the next four weeks, and in the thirteenth week give a small dose of "606" to prevent a Herxheimer reaction, and one week later a full dose of "606," and subsequent to

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this eight weeks of mercury and iodides. This treatment they state can be continued indefinitely, with three months' rest in twenty-four, and will produce a complete cure with the minimum of danger and without recurrences.

There is a tendency now to administer the drug in smaller doses daily, or on alternate days, with a view to preventing anaphylactoid reactions, and to keeping the drug constantly in the circulation. While this is possible with in-patients it is difficult in the large out-patients' clinics throughout the country.

Emery and A. Morin<sup>10</sup> recommend doses of 0.02, 0.03, 0.04, 0.06, 0.08, and 0.10 grms. repeated daily for five or six days to begin with, and subsequent to this curative doses at the usual intervals; and with this method one certainly sees very few reactions and rapid disappearance of the lesions.

*Salvarsan and its Substitutes.*—There are differences of opinion as to the relative merits of the "606" or "914" group. It may in general be said that the former, while they are more toxic and more difficult to prepare for administration in single doses, are more potent and lasting in their effects; the latter are easier to prepare and less subject to reactions, though scarcely so potent and much more liable to decompose in solution.

Galyl, introduced by Mouneyrat in 1913, quickly clears up symptoms, but is not so lasting in its effects as either "606" or "914," and the number of clinical relapses which have been found to follow its use are greater than with the original preparations, while it is no less toxic than them.

Di-sodo-luargol, introduced by Danysz, contains silver bromide and antimony in addition to arsenic, and has been favourably reported on by Renault, Franckel, and many workers. In doses of 0.1 to 0.2 grms. weekly, it does not give rise to intolerance so quickly as either the "606" or "914" group. It is more stable than them, can be given either intravenously or intramuscularly, and is of special use in malignant types of syphilis.

Silver salvarsan, a similar preparation but containing no antimony, has lately been produced by Kolle,<sup>11</sup> who is continuing Ehrlich's work on the combination of salvarsan with various metals. In experiments on rabbits he found it less toxic and more active than salvarsan. Kreibick,<sup>12</sup> in 400 cases, found it superior to and less toxic than salvarsan. Levy-Lenz<sup>13</sup> and many other observers have confirmed this, and state that primary and secondary symptoms rapidly subside and that no bad effects occur either during or after injection. He gives the drug concentrated in doses of 0.1 grm. in 3 c.c. of distilled water. Gennerich<sup>14</sup> uses doses of 0.1 to 0.3 grms. in 20 to 30 c.c. of 4 per cent. normal saline, and administers it at intervals of four to

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five days, giving in sero-negative primary syphilis five to six injections, in sero-positive seven to ten, and in secondary cases eight to twelve injections. The side effects are less marked than with salvarsan, and in 1000 cases he had only 4 cases with severe reaction such as fever, dermatitis, and jaundice. Shönfield and Birnbaum<sup>15</sup> think that it is superior in action to "914" salts, but is not so active as the original salvarsan and found side effects fairly frequent after its administration. Fabry thinks it is the most powerful spirochoetocide and superior to all earlier arsenical salts. He also comments on salvarsan sulphoxylate<sup>16</sup> (1495), a convenient preparation of arsenic in soluble form in 20 per cent. solution; it is very stable, remains for a long time in the body, is very safe, and thus useful for intermittent treatment.

Iacol and sulpharsenol are the latest preparations to be tried. Mantegazza<sup>17</sup> working in the Sero-Therapeutic Institute of Milan states that iacol is as good as the original salvarsan and better than the neo-salvarsan group. Sulpharsenol is prepared by Lehnhoff-Wyld and contains the base of "606," with a molecule of acid sulphite of soda united together by glycol. It is extremely stable, non-toxic, and therapeutically very active. Doses from 0.06 to 0.9 gm. can be given either intravenously, intramuscularly, or hypodermically in solution in distilled water, and the drug does not change on exposure to air. There is little or no pain after its administration by any of the methods. So far only thirty-three cases have been reported by Levy Byng, Lehnhoff-Wyld, and Gerbay,<sup>18</sup> but the low toxicity of it and its easy administration should make it worth an extended trial.

*Methods of Administration.*—Since the introduction of "606" by Ehrlich the intravenous route has been the method most in use. The intramuscular or deep subcutaneous method is not applicable in the case of the "606" group because of the severe pain resulting, but has been tried extensively in the "914" group since its introduction by Wechselmann and Eicke. With careful technique it is a very safe and satisfactory method and rarely gives rise to any reaction. White, Harrison, and Mills<sup>19</sup> reported on 300 parallel cases treated with "606" intravenous and "914" intramuscular, and the results as judged by clinical and serological tests were superior in the group treated by the intramuscular method. This work has been confirmed by others, especially Leonard and Mills; and if the pain at times incidental to this method could be eliminated, it would make specific arsenical therapy much safer and much easier. The two best solvents for the drug are a solution of guaiacol and glucose in distilled water, or a creo-camp preparation with a melting-point of 15° C. With the former preparation a dose of .6 gm. of "914" can be dissolved in 1 c.c. of the solution, and if given with careful technique and the part well massaged



afterwards the pain is usually negligible. Leonard<sup>20</sup> states that 95 per cent. of cases treated by this method give negative Wassermann results, as compared with 88½ per cent. of cases treated intravenously. The author's experience has been a similar one, and there is no doubt that the slower absorption and excretion of the drug when so given gives the therapy a more durable effect. This method is especially of use in cases where from the physical condition of the patient a potent dose given intravenously would be likely to be followed by severe reaction.

*Reactions following on Administration of "606" and "914."*—These are chiefly of the vaso-dilator type and are rarely seen in patients who have been properly prepared by the administration of an aperient and fasting for four or five hours prior to the drug being given. Milian<sup>21</sup> first drew attention to the value of adrenalin chloride in treating this condition, and Birman to the prophylactic use of it in warding it off. He recommended 1 c.c. by mouth or hypodermically, or ½ c.c. intramuscularly of a 1-1000 solution. The attacks take place either during or soon after the injection of the drug, and are thought by Milian to be in the nature of nitritoid crises following on intracerebral exudation. There is also a more dangerous type of reaction which is rare and occurs later on, which Milian terms a serous apoplexy, and which corresponds to the hæmorrhagic encephalitis described by others. Marschalko who found punctate hæmorrhages in the brain of such cases thinks with Beeson<sup>22</sup> and others that this is due to adrenal insufficiency, and that the vaso-dilator properties of the arsenical drug give rise to a serous apoplexy in the presence of diminished adrenal activity. Warthin, on the other hand, thinks that they are due to the action of the arsenic on the renal epithelium. Sée<sup>23</sup> and Bory<sup>24</sup> report fatal cases which the latter describes as arsenical eclampsia. Stokes<sup>25</sup> of Rochester thinks that the reactions are anaphylactoid in character, and advocates the use of atropin,  $\frac{1}{50}$  gr. hypodermically, to produce a state of anti-anaphylaxis and so prevent them and increase tolerance of the drug. Woolbarst<sup>26</sup> states that by using as a solvent for the drug aerated distilled water containing 0.7 vols. of oxygen, 1.26 vols. of nitrogen, and 0.06 vols. of CO<sub>2</sub>, the oxygen in the water oxygenates the red blood-cells, and so overcomes any toxic effect of the arsenic in the blood. If these reactions are anaphylactoid, then the method advocated by Emery and Morin described above would be effective and would, according to Besredka's teaching, produce an anti-anaphylactoid state.

While reactions do occur in susceptible cases in spite of all precautions being taken as to testing the urine for albumin, watching the body-weight, etc., they can in most cases be averted by careful examination and preparation of the patient as for a surgical operation,

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and by enforcement of rest both before and after administration of the drug. Care in the distillation and sterilisation of the solvent and asepsis in the technique of administration are of importance. The rate of flow of the drug into the vein and the concentration of the drug are also factors in producing them. The more dilute the solution is with the "606" group the better, and at least 25 c.c. of normal saline should be used to each 0.1 grm. of the drug. With the "914" group, 10 to 20 c.c. of distilled water are required for each dose of 0.3 to 0.9 grms.

*Mercury.*—Mercury was applied to the treatment of syphilis almost as soon as the disease appeared in Europe, and until the advent of salvarsan salts retained its position, although at times discredited, as the most valuable drug we possessed in the treatment of syphilis. Since the introduction of the arsenical remedies in 1910 there has been a tendency to relegate mercury to a minor place in the treatment ; but the pendulum is swinging in the opposite direction, and the general consensus of opinion now is that mercury is a valuable adjunct to arsenical therapy in the early treatment and indispensable in the later manifestations of the disease. So far from the two drugs being antagonistic they can be administered well together and mutually reinforce each other. Loewy and Wechselsmann believe that mercury in combination with "606" gives rise to an increased susceptibility to toxic reactions by reason of its effect on the blood vessels. This is certainly noticeable in the treatment of pregnant women with the arsenical remedies, where mercury is not so well tolerated and often gives rise to renal disturbances. Wittenberg in the *New York Medical Journal* criticises the simultaneous use of salvarsan and mercury, and prefers to employ salvarsan, the stronger spirochoetocide first, and follow after an interval with the weaker mercury, after the arsenical remedy has become comparatively inactive. The spirochæta, he states, "becomes arsenic 'fast' and also mercury 'fast,' and the immunity building cells of the body overstimulated if either is used in too large amounts or over too long a time." He therefore advocates a period of rest alternately from each drug, long enough to permit the first drug to be eliminated completely and the spirochætes and immunity building tissues to resume their original sensitiveness before repeating a second course, and in the interval of rest alternates with the other drug.

McDonagh<sup>27</sup> states that the simultaneous use of "606" and mercury increases the incidence of early nervous syphilis, and that mercury should be given intermittently after "606" for two years but not with it.

Klauder,<sup>28</sup> in discussing early neuro-syphilis, expresses the view that many such early cases are due to a Herxheimer reaction following

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on "606," and to avoid it he favours the administration of a preliminary course of mercury before giving the arsenical preparation, and points to the harmfulness of insufficient and exclusive treatment with the latter.

While "606" and its substitutes are powerful remedies, and in many cases will alone effect an absolute cure, there are some patients who are intolerant of it. Others do not respond quickly to its influence, and others again relapse after apparent cure. It is wiser, therefore, in the present state of our knowledge to assist the therapeutic action of the arsenical preparations by the simultaneous administration of mercury, and, as suggested by Ehrlich, attack the *Spirochaeta pallida* from different sides by therapeutic agents of distinct types.

There are five principal methods of mercurial administration:—(1) Inunction; (2) Intramuscular injection; (3) Administration by mouth; (4) Intravenous injection; (5) Fumigation.

The method of *inunction* is the oldest of all the methods, and Rabelais in the fifteenth century, in his Prologue to *Pantagruel*, congratulates Gargantua on having relieved the sufferings "of the poor syphilitics, anointed to the point at which their teeth started like the keys of an organ when played on." The uselessness of salivation was pointed out by Chicoyneau as long ago as 1718, and is now universally admitted. Mercury if applied carefully and under supervision in the form of a 33½ per cent. mercurial ointment is perhaps the safest, most potent, and painless method. It is especially useful in children, where the avoidance of digestive disturbances, due to its administration by mouth, is important. In the adult the chief drawback to its use is that it takes time, cannot be done secretly, and is not cleanly. To be properly carried out the services of a skilled rubber are required, and in conjunction with balneo- and hydro-therapy as carried out at Aix, it is one of the most effective methods of using the drug.

*Ingestion by the mouth* in small doses and continuously over long periods has long enjoyed a marked degree of popularity. It has decided drawbacks in that (a) there is no certainty as to the patients continuing to take it, especially at the regular intervals and over the long periods required; (b) it acts too slowly and irregularly; (c) it tends to set up gastro-intestinal disturbances and salivation. The most convenient form is a pill such as that suggested by Hutchinson containing hydrarg. cum cret. 1 to 2 grs., or by Ricord containing the protoiodide of mercury  $\frac{3}{4}$  to  $\frac{1}{2}$  gr.

*Fumigation* is useful in some of the secondary manifestations, but is very uncertain in its action and difficult to control as to dosage.

*Intravenous injections* are rapid in their action but apt to produce toxic symptoms. If used 1 c.c. of a 1 per cent. solution of the cyanide



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of mercury or biniodide is injected on alternate days. Linser<sup>20</sup> advocates the simultaneous intravenous injection of neo-salvarsan and perchloride of mercury in doses of 0.45 grm. of the former and 0.02 grm. of the latter given twice weekly. The perchloride is used in a 1 per cent. solution without the addition of sodium chloride. Both drugs are dissolved in warm water and injected with a glass syringe and good results are stated to have been obtained in 8000 injections given to 1000 patients.

*Intramuscular medication* is that in most general use in this country, and the insoluble salts of mercury are preferable to the soluble as with them the effect, although not so rapid, is maintained over a longer period. They are less painful and do not require to be given at so frequent intervals as the soluble salts, which are rapidly absorbed and as rapidly excreted. The insoluble salts most commonly used are calomel, metallic mercury in the form of grey oil, and salicylate of mercury. Calomel gives rise to more pain than the others and produces stomatitis rather more quickly. The salicylate gives rise to least pain, though it is perhaps not so active as the grey oil in a fine state of subdivision.

With careful asepsis and proper technique there is little or no discomfort by this method, especially if the preparation is planted deep enough in the tissues and the site of injection is well massaged for five minutes after the injection.

The amount of mercury given should approximate at least  $\frac{1}{2}$  to 1 gr. of calomel, 1 to 1 $\frac{1}{2}$  grs. of metallic mercury, or 1 to 2 grs. of salicylate at weekly intervals over a period of seven to eight weeks.

The intermittent method of giving mercury is preferable, and by it side effects such as stomatitis, ptyalism, gastro-intestinal disturbances, and nephritis can in most cases be avoided and the action of the drug kept up over a long period, if the general health of the patient and the hygiene of the mouth are attended to.

*Iodides.*—In the early stages of syphilis, iodine does not play so important a rôle as in its later manifestations. It has no germicidal effect on the *Spirochæta pallida*, but is valuable in that it opens up the tissues and lymphatics and enables the spirochæticidal drugs to obtain access to the infiltrated areas and hyperplasias which result from syphilitic infection.

In early cases iodides are best given immediately after a course of arsenic and mercury and in the intervals of subsequent treatment, and when so given they enhance the action of both.

M'Donagh<sup>30</sup> recommends the administration of colloidal iodine prior to the use of salvarsan salts to prevent metallic intoxication and early hæmorrhagic encephalitis. Of the iodides the potassium salt is the most generally used, and the average dose, 10 grs., should be rapidly

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increased to 20 or 30 grs. t. i. d. If it causes dyspepsia it may be administered in milk or whey or combined with pepsin.

**General Treatment.**—In all cases of syphilis the general health of the patient must be attended to and the body-weight kept up. Overwork, mental strain, undue exposure, and excesses of all kind must be avoided. Alcohol and tobacco are harmful and should be given up.

The hygiene of the mouth and of the skin should be attended to as both aid naturally in the elimination of mercury. The diet should be regulated so as to avoid gastro-intestinal irritation which prevents the proper elimination of both arsenic and mercury.

**Duration of Treatment of Early Syphilis.**—In addition to treatment by arsenic and mercury observation of the patient for a considerable period afterwards is essential, even if the Wassermann test is negative. The longer the period of observation the better it is for the patient. Two years is at yet the minimum period of safety, and before discharging a patient as cured the serological reactions taken at intervals during this time should have remained consistently negative. Intervals of three months during the first year and of six months in the second year are suitable times to test the blood serum, and the value of the test is enhanced if seven days prior to the blood being drawn off, a small dose of "606" or "914" is administered. The patient should also be examined clinically during the same period, and before finally being discharged as cured the cerebro-spinal fluid should be tested for increase of cells and of globulin and for the Wassermann reaction.

Only after such period of observation with negative results is one justified in assuming that the patient will neither transmit the disease to others nor himself develop a neuro-recurrence.

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## NEW BOOKS

*The X-ray Atlas of the Systemic Arteries of the Body.* By H. C. ORRIN, O.B.E., F.R.C.S.Ed. Pp. v. + 91, with 33 illustrations. London: Baillière, Tindall, & Cox. 1920. Price 12s. 6d.

Dr Orrin has made a valuable contribution to our means of studying the regional distribution of the blood-vessels for purposes of practical surgery and medicine. After much patient research he has devised an injection medium which permeates the whole arterial system and is adapted to the purposes of radiography. The series of plates of which the atlas is made up, illustrates with great clearness the course, relationship to bones, ramification and collateral anastomosis of the whole of the arterial system. To the teacher and student of anatomy these plates will prove a valuable adjunct to dissection; they will also be found most helpful in the teaching of operative surgery, particularly on the limbs. A single glance at Plate VIII., for example, which depicts the arterial supply of the hand, reveals more of the vascular arrangements than pages of description or hours of talking would do. A series of stereoscopic radiographs of the various regions is also supplied, and these, when viewed in the hand stereoscope, afford a wonderfully graphic picture of the vessels. The student will find these most useful in elucidating the intricacies of collateral circulation after ligation of arteries. The plates (large quarto size) are beautifully reproduced and the price of the work is exceedingly moderate.

*The Industrial Clinic; a Handbook dealing with Health in Work by several writers.* Edited by EDGAR L. COLLIS, M.D. (Oxon.), M.R.C.P., Talbot Professor of Preventive Medicine in the University of Wales. Pp. vii. + 239, illustrated. London: John Bale, Sons & Danielsson, Ltd. 1920. Price 10s. 6d. net.

The growth of modern industry, with its aggregation of, it may be, several thousands of workers in a single factory, and more lately the experience gained during the war, have shown how closely inter-related are industrial output and the health of the individual worker, which in turn depend on the conditions under which he lives at home and works in the factory. During the war, work of permanent value to those engaged in industry was published on such subjects as Industrial Fatigue, the Hygienic Conditions of Work in Factories and Workplaces, the institution and management of canteens, etc. In the handbook before us much of this work is summarised and placed before the reader by experts on the subjects dealt with. Prof. Collis has provided a general introduction.

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The work, which is well printed and appropriately illustrated, is of convenient size and can be readily held in the hand. The subject-matter is dealt with in an interesting and informing manner by recognised authorities. It is a book that can be recommended to all interested in the health of the industrial worker, and should be in the hands of all Factory Surgeons and Works Managers.

*The Principles of Ante-natal and Post-natal Child Physiology—Pure and Applied.* By W. M. FELDMAN, M.B., B.S. Pp. 694, with 135 illustrations. London: Longmans, Green, & Co. 1920. Price 30s. net.

Dr Feldman has aimed at providing in this volume a complete and detailed account of present-day views on the physiology of the ante-natal, natal, and post-natal phases of the development of the human child. The book is therefore epochal in its way, for it is the first of its kind, and it indicates that the study of child-welfare in its widest sense has attained a definite scientific status. The book may also be regarded as one of the richest first-fruits of the lonely furrow so long and arduously cultivated by Ballantyne and the few others whose photographs adorn its pages. Even a superficial purview of the work makes one realise that the devoted labours of those pioneers have succeeded in bringing this tract of knowledge into a condition of rather exceptional fertility. No reader can fail to be impressed firstly with a sense of the great amount of spade-work already done, secondly with the great opportunities awaiting the diligent explorer, and thirdly with the extraordinary suggestiveness of many of the conclusions already reached, and of the methods and lines of inquiry now being followed. Here indeed is a veritable goldfield teeming with riches waiting to be unearthed by those of our young graduates who are anxious to do some profitable digging.

The work is divided into four parts. The first deals with the germinal cells, the process of fertilisation, the nature of the processes of heredity, and with the intra-uterine stage of development. A short second part is concerned with the physiology of the actual birth-stage, while the long third part is devoted to the physiology of the post-natal stage, *i.e.*, of the infant. The fourth part deals briefly with the special physiological peculiarities of the premature infant. It is impossible in a short notice to give any adequate idea of the fullness with which many points are discussed, or of the vasty physiological deeps into which the reader may be drawn. At every possible opportunity, and often with no very obvious provocation, Dr Feldman breaks out into pages of mathematical calculation involving trigonometry, logarithms, and other such methods. After this, simple equations with trifles like square roots scattered through them,

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statistical tables, and graphic curves and formulæ are mere child's play. Whether or not such a display of mathematics is essential to a study of the subject the reviewer does not presume to say, but if it be so it is unfortunate for the present generation of medical men and women, but few of whom have been able to keep up their studies in pure mathematics.

We noticed one or two slips, as where, on page 4, the adult type of breathing is stated to be thoracic in man, and abdominal in woman, but as a whole the book is free from such errors. Each chapter is headed by a quotation, culled with great catholicity of taste, from sources varying from the sublimity of the Psalms, the Major Prophets, and Shakespeare to the veriest twaddle. But such criticisms are merely in passing, and the main fact remains that here is a really important book, which no one interested in the subject, be he obstetrician, pediatric specialist, or "child welfare and ante-natal clinic" specialist, can afford to miss. Dr Feldman has done a signal service in compiling the work, and we offer him our hearty congratulations on his achievements.

*Radiography in the Examination of the Liver, Gall Bladder, and Bile Ducts.* By ROBERT KNOX, M.D. Pp. 64, with 68 illustrations. London: William Heinemann (Medical Books), Ltd. 1919. Price 7s. 6d. net.

Dr Knox has spared no effort in order to make this little book complete in every detail. His experimental investigations show that the probability of demonstrating pure cholesterin gall-stones is slight, but as the majority of gall-stones contain a percentage of lime salts in their composition, he is confident that with increasing experience in technique, and more careful attention to detail, the proportion of accurate diagnoses will increase. The book is well printed and contains many beautiful illustrations; it is a valuable addition to the literature of Radiology, and can be confidently recommended.

*A Manual of Obstetrics.* By JOHN COOKE HIRST, M.D. Pp. 516, with 216 illustrations. London and Philadelphia: W. B. Saunders Co., Ltd. 1919. Price 14s. net.

The author presents this work as a companion volume to his *Manual of Gynecology*. A somewhat new classification of the various types of pelvic deformity has been adopted, probably easier for the student to remember, and sufficiently accurate for all practical purposes. The chapter on "Obstetric Operations" has received generous treatment in a work of relatively small size.



## New Books

*Plastic Surgery of the Face.* By H. D. GILLIES, C.B.E., F.R.C.S.,  
Pp. xiii. + 408, with 844 illustrations. London: Henry Frowde  
and Hodder & Stoughton. 1920. Price £3, 3s. net.

We have no hesitation in saying that this is one of the most notable contributions made to surgical literature in our day. It may be true, as Mr Gillies modestly admits in the first words of his preface, that "plastic surgery of the face is no new development," but it is no less true that he and his co-workers (from whom it would not be right to withhold their due meed of praise) have opened a new era in the history of the subject. We are almost tempted to say that they have at the same time closed it, for it is difficult to imagine how reparative measures could be carried further. When we reflect, however, that the work described in this book was only begun a little over three and a half years ago, and when we learn from its pages what has been accomplished in that short time, we become confident that the enthusiasm and ingenuity of the workers are not yet exhausted. To obtain such results as are here recorded required on the part of the surgeons, not only an exceptional degree of manipulative skill and unlimited patience and perseverance, but a measure of courage that is given to few. Other factors essential to success in such work, which the authors do not allow us to forget, were the indomitable pluck, the endurance and the confidence of the patients to whom they ministered.

The bulk of the work on which this monograph is based was carried out at the Hospital at Sidcup, where cases of facial injuries from the British, Canadian, Australian, and New Zealand forces were collected. The task of repairing such gross damage as many of the *mutillés* had sustained was one which peculiarly lent itself to what has come to be known as "team work," and this the authorities quickly realised.

Major Gillies, the surgical specialist, was fortunate in being able to co-opt a band of skilled workers, including Captain W. Kelsey Fry as Dental Surgeon, and Captain R. Wade as Anæsthetist, both of whom contribute valuable chapters on their respective subjects, and many others from all sections of the British, Colonial, American, and French armies. The sculptor, the artist, and the radiographer were also enlisted, and the share taken by each is generously acknowledged.

It is impossible within the limits set us to do justice to the subject-matter of this work. It is a book to be read and re-read by all who are concerned in the practice of reparative surgery. The initial chapter on the principles of plastic surgery throws a flood of light on many points towards which we have been blindly groping literally for centuries. The author deals with fundamentals, which,

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*when pointed out*, seem curiously simple and obvious. In subsequent chapters he describes the application of these principles to the restoration of the cheek, the lips, the jaws, the nose, and so on, illustrating by drawings and photographs the various steps of the operative procedures, and the end-results, many of which are truly wonderful. The evidence afforded by these illustrations is sufficiently striking, but those who have had the privilege of seeing the patients themselves will readily admit the fitness of the epithet "white magic" that has been applied to the results in this branch of reparative surgery.

It is a sad reflection that it is to the horrors of war that we owe this development of artistic surgery, but there is comfort in the thought that when the call for "menders of the maimed" came, the resources of surgery were not found wanting. We offer to Major Gillies and his collaborators our sincere congratulations on their brilliant achievement.

*Surgical Treatment.* By JAMES PETER WARBASSE, M.D., New York. Vols. II. and III. Pp. 829 and 861. Illustrated. Philadelphia and London: W. B. Saunders Co., Ltd. 1919. Price £6, 6s. per set.

We have already \* noticed the first volume of this comprehensive treatise on Practical Surgery, which dealt with what is included under the term General Surgery. The two volumes now before us are devoted to Regional Surgery, and are on the same exhaustive scale as their predecessor. We have found the work a valuable source of information on methods of treatment. While the author usually indicates his preference with regard to individual operations and methods of treatment, he describes in detail a sufficient variety to meet the requirements of different cases and varying circumstances.

Separate sections are devoted to the special organs—eye, ear, nose—and to gynaecology, and such matters as reparative and cosmetic surgery are fully dealt with. Nor are minor branches like bandaging, first aid to the injured, etc., omitted.

It is impossible to enter into a detailed analysis of such a complete exposition of surgical treatment. Suffice it to say that the practitioner will find it a reliable source of reference in all emergencies. A complete index to the three volumes is bound separately, which greatly facilitates the use of the work for purposes of consultation. The illustrations, which number 2400 in the three volumes, are well chosen and admirably reproduced.

\* October 1919.

## NEW EDITIONS

*The Diagnosis of Nervous Diseases.* By Sir JAMES PURVES STEWART.  
Fifth Edition. Pp. 584, with 298 illustrations. London:  
Edward Arnold. Price 30s. net.

This work has so long been recognised as an excellent presentation of nervous disease from a clinical standpoint that it will suffice to mention the main changes in the present edition. The most notable addition is a chapter dealing with "War Neuroses." The writer disclaims any attempt to discuss the theories of their production advanced by the psychologists, but tilts in a racy fashion at the indiscriminate application of the Freudian sexual hypothesis. To it he, in common with most writers in this country, assigns a definite but limited value. Hysteria is presented as by far the most common neurosis of war, while neurasthenia is stated to be probably the least frequent. The too common loose and inaccurate diagnosis of the latter condition is justly condemned. The effect which the grant of a pension for hysterical symptoms may have in retarding the patient's recovery is commented upon, and the result is summed up in the quotation of the dictum, "A pensioned hysteric is a social parasite." The numerous and useful illustrations have always been a feature of this book. In this edition some new ones appear, amongst them a series of photographs of the footprints produced by the abnormal gaits of various forms of paralysis. The text throughout the book has been revised and incorporates accounts of recently described conditions, such as encephalitis lethargica. The index is fuller and more complete than in previous editions.

To those unfamiliar with this book it may be recommended as an attractive and reliable guide to the clinical study of nervous disease.

*The Diseases of Infancy and Childhood.* By L. EMMETT HOLT and JOHN HOWLAND. Seventh edition. Pp. 1180, with 215 illustrations. New York and London: D. Appleton & Company. 1919. Price 35s. net.

As heretofore, much space is devoted in this book to the consideration of foods and feeding, to disorders of nutrition, and in particular to the subject of infant feeding. In many of the subjects the influence of the teaching of Czerny is marked, but very distinct characteristics of the work are the broad-minded attitude adopted towards all problems, and at the same time the lucidity and definitude of the teaching. Many new articles appear in this edition, and many others have been largely rewritten.



## New Editions

The book is in the first rank among works of reference on the subject; it contains wide information on many subjects germane to practice, and the present edition includes in its pages the most modern scientific views.

*Physical Diagnosis.* By DA COSTA. Fourth edition. Pp. 602, with 225 illustrations. Philadelphia and London: W. B. Saunders Co., Ltd. 1919. Price 20s. net.

The new edition of this well-known book sustains the high standard previously attained. Particular attention has been paid to bring the chapters relating to cardiac conditions abreast of modern knowledge. The results of war experience are introduced, and gas oedema and aviator's heart, etc., fully dealt with.

The illustrations are particularly good, and the index excellent.

*Manual of Obstetrics.* By EDWARD P. DAVIS, M.D., Philadelphia. Second edition. Pp. 447, with 163 illustrations. London and Philadelphia: W. B. Saunders Co., Ltd. 1919. Price 15s. net.

The second edition of this *Manual of Obstetrics* appears as a revised work, with considerable new matter added, including chapters on eclampsia, anæsthesia and analgesia, and placental bacteremia. Anæsthesia and analgesia in labour could appropriately have received fuller discussion, and the statement that the use of scopolamin "can only be successfully carried out in a hospital," has surely been abundantly proved to be erroneous.

The chapter devoted to forceps has been well handled, and the author considers the Simpson forceps as unquestionably the most useful in the majority of cases.

The few pages on disproportion causing prolonged labour are so excellent that we wish the author had devoted more space to this important subject.

*A Manual of Elementary Zoology.* By L. A. BORRADAILE, M.A. Third edition. Pp. xviii. and 616, with 441 illustrations. London: Henry Frowde and Hodder & Stoughton. 1920. Price 18s.

The principal change in this edition is the addition of 21 plates of illustrations. The book deserves high praise for the excellence of its figures, and for the careful treatment of important general questions. The account of Bilharzia might be more extended, and reference should be made to infection through the skin, and the statement that dry cysts of *Entamoeba* are "distributed as dust" should be deleted.

## New Editions

*Practical Histology.* By J. N. LANGLEY, F.R.S. Third edition  
Pp. viii + 320. Cambridge: W. Heffer & Sons, Ltd. 1920.  
Price 10s. 6d. net.

This edition of Prof. Langley's well-known work has been thoroughly brought up to date. Recent improvements in methods, especially those employed for nervous tissues, have been incorporated, and alterations in the description have also been effected. The point of view of function is ever to the fore, and renders the work of special interest to students and teachers of physiology.

*The Use of Colloids in Health and Disease.* By ALFRED B. SEARLE, with Foreword by Sir Malcolm Morris, K.C.V.O. Pp. vii + 120. London: Constable & Co., Ltd. 1920. Price 8s. net.

The chemistry of the Colloids is rapidly assuming a role of commanding importance in biology, and in the present volume, which is based on a lecture delivered at the request of the Chadwick Trustees and published under their auspices, Mr Searle has placed in a simple and comprehensible form some of the conclusions which have been reached, and has indicated their bearings on the problems of Hygiene and Therapeutics. The book contains ten chapters: of these the earlier deal, *inter alia*, with the nature, properties, and preparation of colloids, with colloidal substances in animal and vegetable fluids, and with their relation to micro-organisms and disease, in this manner leading up to the germicidal and disinfectant qualities of colloids, and to their other applications in the sphere of hygiene. The concluding chapters sketch our present knowledge of the use of colloids in medicine, and describe the action of the principal colloidal preparations which have recently been added to the stock of *materia medica*.

Every part of the book gives evidence of practical acquaintance with the scientific aspects of the subject, and although the medical sections are at times tinged with an optimism which a wider experience of therapeutics would certainly have modified, the volume should prove valuable to all physicians who desire to keep in touch with the advances that are taking place in one of the most fascinating and therapeutically hopeful regions that lie on the borderland of physics and chemistry.

*Operative Surgery.* By ALEXIS THOMSON and ALEXANDER MILES. Third Edition. Pp. 619, with 279 illustrations. London: Henry Frowde and Hodder & Stoughton, 1920. Price 16s. net.

Though styled the *third* edition, this volume is virtually a new work. As stated by the authors, it is no longer intended to be a supplement to their *Manual of Surgery*, but rather a companion

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volume. Accordingly, the work has been completely remodelled and its scope considerably enlarged.

Save for the first eighty pages, which are devoted to matters of general application, such as surgical technique and the principles involved in operations on blood vessels, nerves, bones and joints, the subject is dealt with in a regional manner. Each section is prefaced by a brief account of the surgical anatomy of the parts concerned.

The manual is manifestly intended to give a broad survey of modern operative surgery, with sufficient detail to render it of value to student and practitioner alike, and the reviewer confidently believes that it will share the wide popularity of its companion volumes.

## NOTES ON BOOKS

In *Electric Ionisation*, Dr A. R. Friel (John Wright & Sons, price 8s.) gives a clear account of the process of ionisation, and of the means by which the electric current may be utilised to introduce drugs into different tissues for therapeutic purposes. The procedure and appliances are well described and illustrated.

We have received the 36th volume of the *Transactions of the American Surgical Association*, edited by John F. Binnie (Wm. J. Doran, Philadelphia). This series of reports is always welcome as a summary of the progress of American surgery during the year with which it deals. The present volume (1918) contains a number of papers dealing with problems related to war surgery, but there are many others of a more permanent interest.

*Les Blessures du Foie, et des Voies biliaires*, by Professor P. Soubeyran (Félix Alcan), which summarises the writer's extensive war experience of injuries of the liver and bile passages, will prove a valuable source of reference, particularly on the subject of treatment, which is exhaustively dealt with. It is fully illustrated.

We have received the second volume of *Bodily Deformities*, by the late E. I. Chance, F.R.C.S., edited by Mr John Poland (John Murray, price 18s.). It follows on the same lines as the first volume, which was issued some years ago, and of which we understand a new edition is promised, but is principally concerned with the treatment of deformities. Although the lectures on which the work is based were first delivered in 1852, they are still full of interest and suggestion, and contain much information that is useful and is apt to be forgotten.

*Tuberculosis and Public Health*, by N. Hyslop Thomson (Longmans, Green & Co., price 5s.), is a short elementary book on tuberculosis in



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its relation to public health. It is a presentation of facts all already well known. It consists of ten chapters on such subjects as tuberculosis and the health index, types of disease, housing and tuberculosis, etc. It is written in simple language and may be of use to practitioners who desire some knowledge on the subject.

*Advice to Consumptives*, by Noel D. Bardswell (A. & C. Black, Ltd.), consists for the most part of lectures which have been given to sanatorium patients. The fact that the book is now in its second edition would indicate that it has filled a useful place. The short chapters deal with fresh air, food, recreation, occupation, emigration, etc. The book contains an amount of useful information.

Dr Leonard Findlay's *Syphilis in Childhood* (Henry Frowde and Hodder & Stoughton, price 8s. 6d.) is an excellent monograph; written on practical lines, well illustrated by brief case-histories, colour plates, X-ray and other photographs, it presents a sound picture of the disease. Dr Guthrie is a strong advocate for compulsory notification. With regard to treatment, it is notable that he prefers the veins of the scalp for intravenous medication in little children, and that he gives kharsivan and similar preparations in larger doses, and in more concentrated solution than is usual.

*Sight-Testing Made Easy*, by W. Wright Hardwicke (J. & A. Churchill), now in its fourth edition, fails to perform the promise of its title. There are three reasons for this: the style is too much condensed to be lucid—this is especially the case on p. 58; there are some algebraical inaccuracies, e.g. p. 56; there are still several misprints in the book (see especially p. 16).

We welcome a new (fourth) edition of Mr Rendle Short's *New Physiology in Surgical and General Practice* (John Wright & Sons, Ltd., price 9s. 6d. net). Since it first appeared in 1911 this little work has presented to the general reader the successive advances in physiological knowledge that have a direct bearing on medical and surgical practice in an attractive and useful form. The present issue reflects what has been learned during the last six years, which has necessitated the rewriting of the sections on various important subjects, including surgical shock, food deficiency diseases, and cardiac disease. We confidently recommend it as a readable and reliable guide to the most recent views on clinical physiology.

The seventh edition of *Cunningham's Manual of Practical Anatomy*, revised and edited by Arthur Robinson (Henry Frowde and Hodder & Stoughton, price 12s. 6d.), is now completed in three volumes. The third, dealing with the Head and Neck, is now before us. The revision has been very thorough, and many new illustrations of the same high standard as before have been added. This work holds a place all its own in anatomical literature.

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It is difficult to keep pace with the new editions of that anatomical classic *Gray's Anatomy* (Longmans, Green & Co., price 42s. net). The twenty-first edition, again edited by Professor Howden, has appeared. The Basle nomenclature is retained, and we agree with the Editor's statement in the preface that "a careful examination of the Basle terminology shows that, for the most part, it does not consist of new terms but of a selection of old ones, together with such modifications as make for accuracy and brevity in description." The only obstacle to its universal adoption that we can recognise is a condition of mental inertia on the part of anatomists and surgeons in certain schools. When this has been overcome a great boon will have been conferred on students of anatomy.

*An Introduction to Midwifery*, by Archibald Donald, Eighth Edition (Charles Griffen & Company, Ltd.), is a practical handbook for the midwife in training or the medical student beginning his study of obstetrics—this revision of which has been required by the passing of the Midwives Act. The midwife is briefly and clearly instructed in the anatomy and physiology of the pregnant state and in its normal course, together with its more important abnormal forms whereby she may realise the value of antenatal care and examination. The management of regular and irregular labours is treated in a manner likely to be found useful by those for whom the handbook is intended, careful indication being made of those emergencies which may arise in a midwife's practice necessitating the calling in of medical help in accordance with the regulations of the Central Midwives Board, extracts from whose rules are given in an appendix.

Professor C. Bucura has written an interesting Monograph on *Hæmophilia in Woman* (*Über Hämophilie beim Weibe*), (Leipzig, Alfred Holder, 1920), a difficult subject to understand whether one tries to explain it by Mendelism or in other ways. He has collected 200 cases from literature and draws deductions from them; but some of them at least have no very strong claim to be regarded as true hæmophilia. It would, however, be difficult to reach the records of these 200 cases apart from this monograph, and Professor Bucura deserves thanks for so laboriously bringing them together.

*The Wife and Mother*, by Albert Westband, M.A., M.D., C.M. (Charles Griffen & Co., Ltd., price 5s.) has reached a seventh edition, and can claim to satisfy a real need. The volume is neatly got up, and has much of interest to say under the four headings—Early Married Life, Early Motherhood, The Child, and Later Married Life.

# Royal College of Surgeons

## ROYAL COLLEGE OF SURGEONS OF EDINBURGH.

AT a meeting of the College held on 22nd July the following gentlemen, having passed the requisite examinations, were admitted Fellows:—

Harold Bengé Atlee, M.D., C.M. (Dalhousie Univ., Canada); James Clark Bell, M.B., Ch.B., M.D. (Aberd.), Aberdeen; Frederick Cameron, M.B., Ch.B. (Univ., New Zeal.); Alexander Rae Campbell, M.C., M.D., C.M. (Dalhousie Univ., Canada), New Glasgow, Nova Scotia; Frederick Ernest Feildon, M.R.C.S. (Eng.), L.R.C.P. (Lond.), Surrey; Joseph Anthony Ferriere, M.R.C.S. (Eng.), L.R.C.P. (Lond.), M.B., B.S., M.D. (Univ., Lond.), London; Trevor Gayer Fetherstonhaugh, M.B., Ch.B. (Melb.); Thomas Watson Hancock, M.R.C.S. (Eng.), L.R.C.P. (Lond.), Norwich; Sydney Lawrence Harke, M.R.C.S. (Eng.), L.R.C.P. (Lond.), M.B., B.C. (Cantab.), Surg. Lieut. R.N.; William Knox Irwin, M.B., Ch.B., M.D. (Univ., Aberd.), Drumquin, Co. Tyrone; George Brownlee Isdale, M.B., Ch.B. (Univ., New Zeal.), B.Sc., New Zealand; Hugh Hunter Jamieson, M.B., Ch.M. (Univ., Sydney), Sydney, N.S.W.; Colin King, M.R.C.S. (Eng.), L.R.C.P. (Lond.), M.B., B.C. (Univ., Camb.), Sussex; James Tait M'Auslin, M.B., Ch.B. (Univ., Edin.), Edinburgh; Anthony John M'Creadie, M.B., Ch.B. (Univ., Aberd.); William Archibald Mein, L.R.C.S.E. (Triple); Abdul-Chani Neguib Misbah, M.B., Ch.B., M.D. (Univ., Liverpool), Egypt; Duncan Metcalfe Morison, M.B., Ch.B. (Edin.), Edinburgh; George Thomson Mowat, M.B., Ch.B. (Edin.), Lybster, Caithness-shire; William Graham Oakeley, M.B., Ch.M. (Sydney), Toowoomba, Queensland; Guy Harcourt Peall, M.B., B.S. (Univ., Lond.), M.R.C.S. (Eng.), L.R.C.P. (Lond.), Salisbury, Southern Rhodesia; Hugh Noel Murray Puckle, M.B., Ch.B. (Melb.); Matthew Edward Robinson, M.B., Ch.B. (Melb.); Robert Joseph Silverton, M.B., Ch.M. (Sydney), Woollabra, Sydney; Andrew Fulton Sinclair, M.B., Ch.B. (Edin.), London; Francis William Stone, M.B., B.S. (Melb.), Salford, Lancashire; Frans Karel Te Water, M.B., Ch.B. (Edin.), M.R.C.S. (Eng.), L.R.C.P. (Lond.), Johannesburg, South Africa; Cecil Uren, M.B., Ch.M. (Sydney), North Sydney, N.S.W.



# Books Received

## BOOKS RECEIVED

CLAYTON, E. BELLIS.	Medical Gymnastics in Medicine and Surgery	
	(Edward Arnold)	5s.
DOYEN, E., and H. SPENCER-BROWNE.	Surgical Therapeutics and Operative Technique. English Edition. Vol. III.	
	(Baillière, Tindall & Cox)	£2, 5s.
DREYER, GEORGES, and GEORGE FULFORD HANSON.	The Assessment of Physical Fitness	
	(Cassell & Co., Ltd.)	10s.
PATERSON, MARCUS.	The Shibboleths of Tuberculosis	10s. 6d.
	(John Murray)	
TODD, ALAN H.	Lectures on Surgery to Nurses	7s. 6d.
	(Edward Arnold)	
WOODWARD, A. S.	Manual of Medicine. 2nd edition	
	(Henry Frowde and Hodder & Stoughton)	16s.

## ANALYTICAL NOTES

### SKETOFAK ANTISEPTIC CREAM

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AN effective protection against the stings of midges, gnats, and mosquitoes has been provided in this new culicifuge prepared by Messrs Burroughs, Wellcome & Co. Put up in collapsible tubes, it is easily carried in the pocket. When smeared on exposed parts it gives immediate protection, and, what is of almost equal importance, the effect of a single application is persistent. The preparation, which has an agreeable odour, is very effective in allaying the irritation following upon an attack. A useful addition to the holiday-maker's equipment.

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THE Coolidge X-ray tube, in its special dental radiator type, has considerably increased the accuracy and speed of dental radiographs. In the dental tube by far the greater part of the heat imparted to the target is conducted to a copper radiator, instead of being radiated through the glass wall of the bulb. It is therefore possible to make the bulb of the dental tube quite small— $3\frac{3}{4}$  inches in diameter. In addition, the tube is self-rectifying within the limits of its allowable energy output, and can be used directly across the terminals of an induction coil or transformer without any auxiliary rectifying device. The cathode terminal is connected to earth, so that it is possible to bring the tube very near to the patient without danger of shock. A special lead-glass protective shield is supplied.

# Edinburgh Medical Journal

October 1920

## TWO MEDICAL HUMORISTS.\*

By C. E. DOUGLAS, M.D., F.R.C.S.E., Cupar-Fife.

### I.

HARVEIANS,—My first duty as your President is to thank you most warmly for the honour you have done me in appointing me to this office. It involves, as you know, the deliverance of an address, and I confess to a desire to emulate in moral courage the one President of all my predecessors, who refused to give any sort of address. But I recognise that seniority has its duties as well as its privileges, if any, and so to my task.

I propose to recall to your remembrance two men who have shed lustre indirectly on our profession, not only as mediciners, but as men of large culture and wide humour. Before discussing them, however, one must come to some definition of humour, and this is difficult to do. Humour varies so much with time, locality, and race. The humour of the sixteenth century, for instance, seems so gross to us, that of the eighteenth so stilted and artificial. Let us take a definition given by Mr W. S. Lilly in his *Four English Humorists of the Nineteenth Century*, a quartette, be it observed, in which he has the temerity to include Carlyle. "The humorist," he says, "is an artist who playfully gives us his intuition of the world and of life." With this definition I do not entirely agree. I am not sure if it even applies to Carlyle, and it certainly leaves out Swift and many others. I prefer that definition (I think the idea is Bergson's) which sees in humour a lively sense of the incongruous in the world and in life. But we may accept Lilly's definition at present, as the two medical humorists in question are entirely included within it; both are "laughing philosophers," full of the joy of life.

\* The Harveian Oration delivered to the Edinburgh Harveian Society, 16th July 1920.

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The first of these is that big genial monk, turned physician, that burly man with the full square forehead, the flowing beard, and the laughing brown eyes, as we see him in the Montpellier portrait—François Rabelais. To many he is but a name. He is indeed, it may be said, "caviare to the general." To him has come that fate which Shakespeare described: "the evil that men do lives after them, the good is oft interred with their bones." To many the phrases "Rabelaisian wit" meaning obscenity, and "Gargantuan repast" meaning gluttony, are all that keep his memory alive. It is true that his work is encumbered with the indecencies common to all literature of the age and of the two succeeding centuries, and his readers must be prepared for this. The men of those times lived nearer to Nature than we in our more highly developed civilisation, and like children they talked quite openly of things regarding which it is usual now to be mute. If we step back in civilisation to the sweet country air of a distant farm-steading we must expect to find the manure heap, the pig-stye, and all the primitive sanitation of the place. The sanitarian unwittingly has cleansed our literature as well as our streets. The man who reads his Rabelais only as an example of pornographic literature is to be pitied. Like the man in that other great allegory who worked with the muck-rake, he must be blind to the jewels around him. It has often been said that from any work of art the observer can only carry away what he is fit to understand and properly appreciate, and this applies well to students of our author.

I propose to introduce him to you under three aspects.

He was in a sense one of the forerunners of Harvey—not, I think, in the scientific sense. There are those who include him here. Willis, in his *Life of Harvey*, includes him in the long line from Aristotle to Fabricius; but I do not subscribe to this. I find nothing in *Gargantua* or *Pantagruel* which cannot be traced to Galen, of whom he was undoubtedly a profound student. His bent in science was more towards botany, of which he knew much; he names no less than one hundred and ninety-four plants in his great work, and incidentally he introduced the melon, the artichoke, and the carnation into France by his travels in Italy. There is no evidence of his having done any research work in medicine. But as a literary forerunner of Harvey he has a distinguished place. He was a great Greek scholar, specialising in the study of the Greek physicians. Born in 1490, he was placed by his mother, who seems to have been



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a woman of discernment, in a convent school, whence he passed into a Franciscan monastery. Here he remained for thirty years, and, *mirabile dictu*, became profoundly versed in the New Learning. How this came about in a Franciscan monastery is one of the mysteries of Rabelais. The Franciscans are not, like the Benedictines, an Order distinguished by culture. Their founder, in pursuit of his noble ideal of "Liberty, Truth, Poverty," had no thought of literature or of culture generally, and its rule is strict. The "New Learning," however, had penetrated to the Franciscans, and was dreaded by them, being very rightly suspect of subversive tendencies. Rabelais, as one devoted to the study of Greek, was regarded by his brethren with suspicion, and was "vilely and shamefully treated" by them.<sup>1</sup> He therefore obtained leave to join the Benedictines, an Order much more cultivated and in which Rabelais would have had the life of quiet leisure which a scholar like him would have enjoyed. But he had other things in view, and we find him next, after two years spent in medical study in Paris,<sup>2</sup> as a matriculated student in the University of Montpellier. His name as a Greek scholar had by this time been made, and probably in virtue of it he obtained the degree of Bachelor of Medicine in Montpellier after two months, instead of the usual three years' curriculum, which even then was required by that University. Immediately on graduation he gave courses of lectures on the Aphorisms of Hippocrates, and on Galen, courses which may have the basis of the book, his first venture in literature, *Hippocrates et Galen, libri aliquot*, published for him by Gryphius at Lyons in 1532. For two years he served as a physician in the Hotel Dieu in Lyons, a city which at that time resembled our own in being at once a great medical school and an important centre of literature. Rabelais then may be regarded, from his attainments in Greek and his position as one of the first to diffuse a knowledge of Greek medicine into Europe, as a forerunner of Harvey, whose devotion to the Greeks and whose indebtedness to Aristotle, Hippocrates, and Galen were constantly acknowledged by him.

At Lyons, Rabelais was under two influences, medicine and literature. He had left the Franciscans; the Benedictine Order was open to him, but he put it aside. He had in him a purpose, and that could best be carried out in the world. Literature was the means by which this purpose could be served, and to literature he now devoted himself. He began to write the

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*Gargantua* and the first book of *Pantagruel*, as he said, to amuse his patients. He must have said this with a smile. He had others in view besides the sick. This is the next aspect of Rabelais. He was a powerful factor in the Reformation. We all recognise the parts played by Luther, the "firebrand," and by Erasmus, the cultured and classical critic. But Rabelais, by his laughter, addressed to the common people, and, couched in the common vernacular of France, reached many whom neither Luther nor Erasmus could touch. John Hill Burton, who knew his Rabelais well, says of him, that he "laughed at things centuries before they became ridiculous to other people."<sup>3</sup> The corruption of the monasteries, the degeneracy of the monks and their decrepit system, these were the objects of his raillery. Like all reformers, Education was understood by him, and its importance in any attempt at reform was recognised. Here is a description of the kind of education prevalent at the time. *Gargantua* has been sent to Paris as a student in the University.

"He gets up about eight (corresponding to about eleven o'clock with us), when he combed his head with a *comb de Almain*, which is the four fingers and the thumb, for his preceptors had said that to comb himself otherwise, to wash and make himself neat, was to lose time in this world." After breakfast they take him to church, where he heard six-and-twenty or thirty masses. After church he did study some paltry half-hour with his eyes fixed on his book; but his mind was in the kitchen. When that was done he ate meat agreeable to his appetite, and left off when he was like to crack for fulness. As for his drinking he had in that neither end nor rule: for he was wont to say that "a man might drink till the cork of his shoes swells up half a foot high."<sup>4</sup> Then cards and dice, drink, more paternosters, and so to bed. Such apparently was a parody of the education in a convent of the time.

Contrast with this the scheme set out in a letter from *Gargantua* to his son, the wise *Pantagruel*, the son being then at Paris for his education. This is how he is enjoined:— After duly impressing upon him the advantages enjoyed by the youth of the present day compared with his own days at college (much as is done nowadays), he goes on to say: "Now it is that the minds of men are qualified with all manner of discipline and the old sciences revived, which for many ages were extinct: now it is that the learned languages are to their pristine purity restored, viz., Greek (without which a man may be ashamed to

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account himself a scholar), Hebrew, Arabic, Chaldean, and Latin. Printing likewise is now in use, so elegant and so correct that better cannot be imagined, though it was found out in my time but by divine inspiration. And I take much pleasure in the reading of Plutarch's morals, the pleasant dialogues of Plato, and the antiquities of Athenæus, whilst I await the hour wherein God my creator shall call me, and command me to depart from this earth and transitory pilgrimage. I intend, and will have it so, that thou learn the languages perfectly. First of all the Greek, as Quintilian will have it: secondly the Latin: and then the Hebrew for the Holy Scriptures' sake. And that thou frame thy style in Greek in imitation of Plato, and for the Latin after Cicero. Now in the matter of the works of nature I would have thee study that exactly, so that there be no sea of which thou dost not know the fishes, all the fowls of the air, all the several kinds of shrubs. Then fail not most carefully to peruse the books of the Greek, Arabian, and Latin physicians, and by frequent anatomies get thee the perfect knowledge of the microcosm which is man. And at some hours of the day apply thy mind to the study of the Holy Scriptures, the New Testament in Greek, the Old in Hebrew: because, as the wise man Solomon says, "wisdom enters not into a malicious mind, and that science without conscience is but the ruin of the soul; it behoveth thee to serve, to love, to fear God, and on him to cast all thy thoughts and all thy hope."<sup>5</sup>

It would seem proper to say somewhat here of what might be regarded as an educational scheme of Rabelais, namely his "vision" of the Abbey of Thelema, described by Sir Walter Besant as "one of the most graceful and noble fancies that ever entered into the brain of man."<sup>6</sup> It was indeed a daring scheme, thought out by one who for thirty years had suffered the soulless monotony of life in a mediæval monastery. The "damnable iteration of the bells" beating out week after week and year after year, the same weary round of trivial duties, the low level, physical and mental, of the ordinary denizens, the binding nature of the vows once taken, and the restriction of all natural and human impulse—all these were anathema to him, and were to be done away with in the Abbey of Thelema. All the conventional rules were to be set aside. "No women who were not fair, well featured, and of sweet disposition, nor any men who were not comely, personable, and well conditioned—all should have leave to depart in peace and contentment whenever it should



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please them to do so. And considering that religious men and women do ordinarily take the three vows of chastity, of poverty, and of obedience, it was ordered that they might be honourably married, that they might be rich, and that they might be at liberty." It was more than a beautiful dream; it was intended, I believe, as a satire on the system then in vogue. The choice of its motto, "*Fay ce que voudras*," seems also to show that the scheme was drawn up in jest. When one reads it the thought occurs, "How like Rabelais that is, a real Epicurean motto." Yes, but Rabelais was no Epicurean. No Epicurean would have forsaken the cultured ease of a Benedictine monastery, and come out into the world to face danger and death, as he did, in pursuit of his purpose, the destruction of that corrupt system the evils of which he knew so well. His philosophy, one may gather, was other than Epicurean if we recall that quaint story in his second book, "How Epistemon had his head cut off and healed by Panurge"; we shall see which schools in philosophy he favoured. Here is the story of Epistemon:—After a battle Epistemon was lost, and on seeking him "they found him with his head between his arms, all bloody. Then Panurge cleansed his neck very well with pure white wine, and took his head and anointed it with I know not what ointment, and set it on very just, vein against vein, sinew against sinew, and spondyle against spondyle, that he might not be wrynecked, for such people he mortally hated. . . . Suddenly Epistemon began to breathe, then opened his eyes, yawned and sneezed . . . after which a glass of strong wine and a sugared toast revived him." He was then able to say that he had been in Hell, and gave an account of the people he had seen. "Their estate is changed, but only after a very strange manner. For I saw there Alexander the Great mending old stockings, Xerxes was a crier of mustard, Hannibal a kettle-maker, Lancelot of the Lake a flayer of dead horses, Nero a base, blind fiddler. On the contrary I saw Diogenes there strut it most pompously and in great magnificence; Epictetus most gallantly apparelled after the French fashion, making good cheer."<sup>7</sup> No notice of Epicurus; only the Cynic and the Stoic philosophers were better off than on earth.

Of the monks themselves one extract will show his opinion:—

"A monk," he says, "I mean those little idle lazy monks, doth not labour and work as do the peasant and artificer, doth not ward and defend the country as doth the soldier, cureth not

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the sick as doth the physician, doth not import commodities and things necessary for the commonwealth as the merchant doth; therefore is it that of all men they are hooted at and abhorred. Yea, but," said Grandgousier, "they pray to God for us."

"Nothing less," answered Gargantua. "True it is that with a tingle, tangle, jangling of bells, they trouble and disquiet all their neighbours about them. They mumble out great stores of legends and psalms without thinking upon the meaning thereof, which truly I call mocking of God and not prayers."<sup>8</sup>

With sayings such as these one cannot but wonder with old Burton how Rabelais "escaped the stake." He did so largely because of influence at court, through the de Bellays, his school-fellows in the convent school, one of whom, the Cardinal, had him in his train when he visited Rome; also because of the personal interest of the King, Francis I., to whom he read his third and fourth "Pantagruel" books before publication; also, perhaps (but this is doubtful), because of his merits, now to be considered as the third aspect of Rabelais, that of story-teller, of novelist.

Rabelais' most enduring title to fame arises from his gift of story-telling, the "holding" quality of him that Mr Saintsbury so admires. Through it he is the creator of Panurge, a character not quite like any other in literature. It is true that, with Shakespeare and Goethe and Burns, and many others, Rabelais "plagiarised" and used characters and stories taken from other writers. Panurge is the "Cingar" of Folengo, another monk of literary tastes who flourished just before Rabelais. But who reads Folengo now? whilst Rabelais, after four hundred years, has still his readers, his critics, his expositors. Panurge suddenly arises in the second book. "One day Pantagruel, conversing with his people, met a man fair of stature and well proportioned in all the parts of his body, but piteously wounded and in miserable guise. When Pantagruel saw him he said, 'See you yon man who comes by the road of the Charanton Bridge? By my faith, he is only poor in fortune. I assure you from his physiognomy that nature has produced him of rich and noble lineage.'<sup>9</sup> Panurge was of a middle stature, neither too great nor too little; his nose was slightly aquiline, made like the handle of a razor; he was about five-and-thirty years of age; a gallant and proper man in his carriage. He had sixty-three ways of finding money at need. Of these, his favourite way was some means of secret thieving, but as he had 214

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ways of spending it, he was continually poor." Around this character the last three books are written. His pranks and bits of mischief, his proposed marriage, the voyage (a kind of Odyssey), to enable him to consult the Oracle of the Divine Bottle—these all form a character-sketch, the leading motive of this great allegory—for such it is, this book of Rabelais. To follow him through it all would be to lecture on the book, and I am only concerned to depict the man who wrote it. Panurge is his great creation, as Mr Saintsbury says, "the ancestor, in the literary sense, in which he has been followed by the similar creations from Cervantes to Thackeray."<sup>10</sup>

My reading of Panurge is that he is an allegory of the natural man, the primeval, pithecoïd ape, as he would be without the human soul within him. The name Pan-Urge (not *Demi-Urgos*, but *Pan-Urgos*), the complete reprobate, exactly describes him—clever, supple, cruel, treacherous, cowardly, animal, and as such an object of derision. This view, that lapses from virtue have in them an element of the ridiculous, is not original in Rabelais, nor does it end with him. He got it from the Greek idea of virtue and its opposite. He may have got it from Epictetus. Listen to this from one of his discourses: "If a man could only take to heart this judgment, as he ought, that we are before anything else children of God, and that God is the father of gods and men, I think that he will never harbour a mean or ignoble thought about himself. Why, if Cæsar adopts you, your arrogance will be past bearing; but if you realise that you are a son of Zeus, will you feel no elation? We ought to be proud, but we are not; as there are these two elements mingled in our birth, the body which we share with the animals, and the reason and mind which we share with the gods, men in general decline upon that wretched and dead kinship with the beasts, and but few claim that which is divine and blessed. . . . By reason of this lower kinship some of us fall away and become like wolves, faithless and treacherous and mischievous, others like lions, savage and brutal and untameable; but the greatest part of us become foxes, and the most godforsaken creatures in the world. For a foul-mouthed and wicked man is no better than a fox, or the meanest and most miserable of creatures. Look to it, then, and beware lest you turn out to be one of these godforsaken creatures."<sup>11</sup>

The same idea we have in Carlyle's *Sartor*, where Teufelsdröck in his wanderings to the North Cape is beset, and defends



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himself against a "Hyperborean Bear" of a Russian smuggler, by means of "a sufficient Birmingham Horse-pistol." A dissertation on gunpowder and on duelling follows, and this humorous analysis of that particular folly: "With respect to duels I have my own ideas. Few things in this so surprising world strike me with more surprise. Two little visual spectra of men, hovering with insecure enough cohesion in the midst of the unfathomable, and to dissolve therein at any rate, very soon—make pause at the distance of twelve paces asunder, whirl round, and simultaneously, by the cunningest mechanism, explode one another into dissolution, and off-hand become air and non-extant! Deuce on it (*verdammt*), the little spitfires! Nay, I think, with good old Hugo von Trimburg: God must needs laugh outright, could such a thing be, to see his wondrous manikins here below." <sup>12</sup>

In later times we have so modern a writer as Mr Kipling using the same idea in his fine "Ode" to Wallcott Balastier, his friend, "Beyond the Path of the Outmost Sun," where these lines are found:—

"They take their mirth in the joy of the Earth, they dare not grieve for her  
pain,  
They know of toil and the end of toil, and they know God's law is plain,  
So they whistle to the Devil to make them sport, who know that Sin is  
vain."

In modern phrase Panurge is a character-sketch of a moral imbecile. Note that Rabelais has not lost sight of the Greek idea of the essentially Godlike in Man. He is careful to assure you that "Nature has produced him of rich and noble lineage." He is "only poor in fortune," that is he is overcome by force of circumstances, as we might say, of heredity and environment. This then is Rabelais' claim on posterity. As a literary forerunner of Harvey he played his part; as a factor in the Reformation he was of value. But as Huxley somewhere says, "There is no more unappetising dish than cold controversy," and we may apply the dictum to the castigation of monastic follies. But as a writer, the first novelist in point of time, and as the creator of the first outstanding literary masterpiece in the delineation of human nature, in European literature, Rabelais has a place of his own that cannot be denied him.

Apart from his merits under the different aspects which I have endeavoured to describe him, we in Scotland have two reasons why this medical humorist should be of interest to us.

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One is that the finest translation of his works was made by a Scotsman, Sir Thomas Urquhart, that strange eccentric from Cromarty, who, like our Harvey, was a King's man, a high Tory, and one who also, like Harvey, was despoiled of his writings by the Puritan soldiery at Worcester fight. There must have been earlier translations, for Gargantua is named in *As you Like It*, written before Urquhart was born. But though not the first it is certainly the best, and it remains Urquhart's chief title to remembrance.

The other point of interest is that whilst Rabelais is perhaps the only man in France, or indeed on the Continent, who set himself to reform the abuses in the Church by means of ridicule, we had in Scotland a parallel case, one his exact contemporary, whose method was the same—I mean that excellent Fifer and gallant Scottish gentleman, Sir David Lindsay of the Mount. The two had much in common. Both born in 1490, they both died about 1553. Each sought to reform clerical abuses by ridicule, the one as novelist, the other as poet and playwright. Neither was "heretic," both dying under the *ægis* of the Church; but the attacks they made upon those abuses were enough, had not each been protected by kingly influence, to have brought them to the stake with their friends Dolet, Desperiers, and Patrick Hamilton. They were brave men these, speaking out what was in them without fear of consequence. As Huxley somewhere says, "At a time when an error in logic ensures combustion, not only in the next world but in this, the framing of Syllogisms acquires a peculiar interest," and the same might apply to more literary ventures.

Rabelais belonged to one of the two groups into which we can divide the famous mediciners who have touched the other arts. He was one of those who for a time both taught and practised medicine, but eventually left it; for he was Curé of Meudon till shortly before his death. Others there are like him. We can understand how men like Goldsmith and Lever and Smollett should be more attracted by the charm of art than by the lure of medicine; it is perhaps good that a great mind like that of Locke should have concerned himself more with the philosophy of the human understanding than with the problems of the human body, and that Leander Starr Jameson should have done his part as a builder of Empire. But there are men of another group who, remaining in the profession, have given some time to some form of art. Sir Henry Thomson was a fine

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painter in oils, Sir Seymour Haden a great etcher; Mark Akenside never quitted the ranks of medicine for poetry, nor did Sir Thomas Browne, nor our own Dr John Brown of kindly memory. My second "medical humorist" is of this class. Whilst Rabelais is selected as an example four hundred years old, and as such the pioneer of all cultured and humorous mediciners, Oliver Wendell Holmes was separated by two thousand miles of distance, a kindred spirit born beyond the Atlantic. Born in that wonderful time, the first decade of the nineteenth century, in 1809, the birth year of Gladstone, of Darwin, of Dr John Brown, and of his own outstanding countryman, Abraham Lincoln, he has some interesting points of comparison with Rabelais. Rabelais was a disintegrating force in the midst of an ancient and absolute monarchy; Holmes was an example of what he himself has called, "the Brahmin Caste of New England," one of the intellectual aristocracy of the new republic. Both, like our David Lindsay, criticised the tendencies of their times by subtle humour. Rabelais, following Aristotle, says that "Laughter is man's property alone." True, says Holmes, "but if a man does no more than laugh, he had better to have been born a chimpanzee at once, and have risen to the top of his profession." In the manner of their writing they begin to part company. Rabelais has no style. As a story-teller he is great. In respect of this, he may be ranked with Balzac and Dumas, and with the greatest of our Scots story-tellers, with Scott and with R. L. S. But it is in spite of his style. He has none. The great books, or "The Book" as his disciples will call it, has no proper beginning nor end, and the whole work is a mixture of stories, of history, of what you will, without any proper sequence of any kind. Holmes, on the other hand, is a master of style. Sir W. Osler, a sound critic indeed, tells us that he places Holmes on his mental bookshelf between Goldsmith and Charles Lamb,<sup>13</sup> and indeed the styles are much alike—clear, crisp, witty. But though we all love the gentle Elia, when one has laid him down there does not appear to be much to be remembered in his writing. With Holmes it is another matter. He is full of ideas, not profound, but stimulating. His *métier* is the poetry of science. I know of no one who has so true an ear for this music, no one who can better use the facts of Nature to illustrate poetic or philosophic thought. In point of style I place him more with R. L. Stevenson, with whom he may very fitly be compared. Both



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of them sought expression in essay, in novel, and in poetic form. It is as essayist, I think, that Holmes is at his best. The discursive style suits his playful wandering from one theme to another, and in the "Autocrat," the "Professor," and the "Poet," we find him using the facts of science in analogy or in parable in a fashion quite his own. True it is that all the poets draw from nature, as any anthology will show. But Holmes' scientific training gave him access to facts unknown to the average man, or even to the poets and artists, keen observers as these quite frequently are. Take that poem of his, the "Chambered Nautilus," one of the finest of his poems, and see how he uses the habit of this mollusc of growing from one shell to another without solution of continuity—

"Through the deep caves of thought I heard a voice that sings,  
Build thee more stately mansions, O my Soul,  
Ere the swift seasons roll ;  
Leave thy low vaulted past ;  
May each new temple, nobler than the last,  
Shut thee from Heaven with a dome more vast,  
Till thou at length art free,  
Leaving thine outgrown shell by Life's unresting sea."<sup>14</sup>

Then here is a neat comparison of wit and wisdom in terms of light:—

"There is a perfect consciousness in every form of wit . . . that its essence consists in a partial and incomplete view of whatever it teaches. It throws a ray, separate from the rest, red or yellow or blue, or any intermediate shade, upon an object; never white light: that is the province of wisdom."

We shall find other examples of this quality of Holmes in his novels. The most noteworthy of these is *Elsie Venner, A Romance of Destiny*. Holmes, from his upbringing, is somewhat of a theologian, and he tells us that the aim of the story is to test the doctrine of original sin. Elsie is a girl whose mother, while pregnant with her, suffered a snake-bite in the throat. By prompt treatment she recovered and the child was born soon after, she herself dying in childbed. The girl exhibits various snake-like qualities, in particular exercising an uncanny fascination over anyone who looks at her. It is certainly, as one old patient told him, a "medicated novel," but is well worth reading even now, as a study in prenatal pathology. Apart from the story the style is clear and fresh. Here is a field-picture which is rather a gem:—

"The second mowing was in hand, and the brown, wet-faced

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men were following up the scythes as they chased the falling grass (falling as the waves fall on sickle-shaped beaches), the foam flowers dropping as the grass flowers drop, with sharp, semi-vowel, consonantal, sounds—*frrrsh*; for that is the way the sea talks, and leaves all pure vowel sounds for the winds to breathe over it, and all mutes to the unyielding earth.”<sup>15</sup>

One other instance from *Elsie Venner* will show Holmes' power of descriptive writing and the way in which medical points are made use of. Elsie is believed to frequent a certain cave in a mountain where rattlesnakes abound. Her teacher, Mr Bernard Langdon, resolves to investigate and comes to the mouth of the cave. “He looked into it. His look was met by the glitter of two diamond eyes, small, sharp, cold, shining out of the darkness, but gliding with a smooth, steady motion toward the light and himself. He stood fixed, struck dumb, staring back into them with dilating pupils and sudden numbness of fear that cannot move, as in the terror of dreams. The two sparks of light came forward until they grew to circles of flame, and all at once lifted themselves up as if in angry surprise. Then for the first time thrilled in Mr Bernard's ears the dreadful sound that nothing which breathes, be it man or brute, can hear unmoved—the long, loud, stinging whirr, as the huge, thick-bodied reptile shook his many-jointed rattle and adjusted his loops for the fatal stroke. His eyes were drawn as with magnets towards the circles of flame. His ears rung as in the overture to the swooning dream of chloroform. Nature was before man with her anæsthetics: the cat's first shake stupefies the mouse; the lion's first shake deadens the man's feeling and fear; and the crotalus paralyses before he strikes. He waited as in a trance, waited as one that longs to have the blow fall and all over, as the man who shall be in two pieces in a second waits for the axe to drop. But while he looked straight into the flaming eyes, it seemed to him that they were losing their light and terror, that they were growing tame and dull, the charm was dissolving, the numbness was passing away, he could move once more. He heard a light breathing close to his ear, and, half turning, saw the face of Elsie Venner looking motionless into the reptile's eyes, which had shrunk and faded under the stronger enchantment of her own.”<sup>16</sup>

One last trait of Holmes, and I have done. He was a lover of Britain. Consider what that meant in his time. He was a child when the war of 1812 against Britain was raging, and he

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must have been brought up by the generation whose teachers had fought in that war. Yet in 1855 here is how he sings of Britain :—

“ Brave singer of the coming time,  
Sweet minstrel of the joyous present,  
Crowned with the noblest wreaths of rhyme,  
The holly leaf of Ayrshire's peasant.  
' Goodbye, goodbye.' Our hearts and hands,  
And lips, in honest Saxon phrases,  
Cry ' God be with him ' till he stands  
His feet among the English daisies.

His home ! the Western giant smiles,  
And twirls the spotty globe to find it,  
' That little speck, the British Isles,  
'Tis but a freckle, never mind it.'  
He laughs, and all his prairies roll,  
Each gurgling cataract roars and chuckles,  
And ridges stretched from pole to pole  
Heave till they rack their iron knuckles.

But Memory blushes at the sneer,  
And Honour turns with frown defiant,  
And Freedom, leaning on her spear,  
Laughs, louder than the laughing giant :  
An islet is a world, she says,  
When glory with its dust is blended,  
And Britain keeps her noble dead  
Till earth and sea and skies are rended.

Beneath each sturdy forest bough,  
Some arm as stout in Death reposes,  
From wave-washed foot to sun-kissed brow,  
Her valour's life-blood runs in roses.  
Nay, let our brethren of the West,  
Write, smiling, in their florid pages,  
One half her soil has walked the rest,  
In poets, heroes, martyrs, sages.

Hugged in the clinging billows' clasp  
From sea-girt fringe to mountain heather,  
The British oak with rooted grasp  
Her slender handful holds together.  
With cliffs of white, and bowers of green,  
And ocean narrowing to caress her,  
And hills, and silvery streams between,  
Our little Mother Isle, God bless her ! ” 17

And so we leave them, these laughing philosophers, the one with his mask of burlesque, covering yet a serious purpose, the



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other with his witty, gladsome way of life. They appeal to us with their love of joy, their smiling scorn of outworn shams. Long may their memory be green and their example followed. We need humour in the profession. It is one of its necessary virtues. For who, save ourselves, and perhaps the police, live in such a *milieu* of disharmonies. We live the life pathological; we breathe the vitiated air of the sickroom, the laboratory, the deadhouse; we daily see sights that turn the layman green and giddy; our ears are filled with the burden of all who are in any way desolate or oppressed in mind or body. We are saved, it is true, by those two saving graces within ourselves, the divine instinct of pity, and the fascination of science. But let us also cling to humour, the antiseptic of life. So now abide these three, pity, knowledge, and humour; and not the least of these—is Humour.

### II.

#### TO THE IMMORTAL MEMORY OF WILLIAM HARVEY.

The later decades of the sixteenth century, and the first half of the seventeenth, form a period of extraordinary interest. In those days, as in the war through which we have just passed, a great power was threatening to impose autocracy on the peoples of Europe against the growing impulses towards liberty, which the Renaissance had called into being. In the latter period the same menace of autocratic rule had been raised in this country, to be met, as before, by the stubborn determination of a people resolved to be free. It was a time not only of great deeds but of great men, when Shakespeare and Bacon and Raleigh walked the earth. But of them all, none, save Shakespeare himself, have attained the immortal fame of him in whose honour we meet this day in festival. He was a lad when the period sets in; he passed away an old man ere its close. It forms an heroic setting for a great figure. He was a boy of ten when the Armada passed up channel on that Sunday in August 1588, and as a happy schoolboy, home for holiday from Canterbury School, he may have cheered on the gallant little English craft as the Armada, out-sailed, out-fought, and terror-stricken, fled before them into Dunkirk roads. Let us follow this boy on through his life and see how he too made good against the forces of authority and of tradition. We know of him as an arts student in Caius College; thence to Padua. Here he met

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his destiny. Fabricius of Aquapendente was one of those who were curious as to the structure and use of the heart and blood-vessels. He was the first great mind to influence Harvey, for we hear nothing of his teachers before this, and he had specialised, as we would now say, in particular on the anatomy of the veins and their valves. Under him, Harvey proved to be an apt pupil, and he came from Padua not only with a splendid testimonial from the faculty there, but with something much more valuable; he had found his work, and had it in him to carry it on. He took with ease the M.D. of Cambridge, which stood him in good stead in London, where he applied for a post at St Bartholomew's, obtained it, and soon after became one of the earliest of the Lumleian lecturers, obtaining this post in 1615 and beginning to lecture in 1616, the year of Shakespeare's death. Most fortunately, the original notes of his lectures have been found after having been lost for a time, and as his first course was one that dealt with the viscera we know precisely his views at that early period of his career. It is of special interest to us, as Scotsmen, to know that the immortal discovery was made by him in a process of intuition, of deductive thought. Here are his own words written at this time, in 1616: "It is plain from the structure of the heart that the blood is passed continuously through the lungs to the aorta as by the two clacks of a water bellows to raise water. It is shown by the application of a ligature that the passage of the blood is from the arteries to the veins. Whence it follows that the movement of the blood is constantly in a circle, and is brought about by the beat of the heart." This was his great hypothesis conceived by him, tested afterwards by experiment, and enunciated in his work, *de Motu Cordis*, years afterwards. In spite of his discovery (for he tells us that his practice "fell mightily" after it was announced), he became a favourite physician, and was Physician in Ordinary to the King, first James and then Charles, the latter of whom, following the Stewart bent for science, took the greatest interest in his researches. In the train of the king, Harvey visited Scotland more than once, being chiefly taken with the Bass Rock and the fauna thereof. The quarrels of faction did not appeal to him. Just as in the well-known episode at Edgehill, so in Scotland he kept aloof from politics. He was a "king's man," it is true, and as such suffered the loss of many valuable papers at the hands of the Roundhead soldiery. But as old age came upon him he retired from the Court and betook

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himself to the quiet pursuit of English literature, and so to a peaceful end, surrounded by his own kith and kin. It is a quiet story this. Like the other two epoch-making Englishmen, Darwin and Lister, his was a quiet life, undisturbed by any untoward events. This was no doubt largely due to his fine quality of mind. He was from first to last a typical English gentleman. An episode in his life may be cited. Whilst on tour in Germany he happened to be near Nuremburg, where dwelt one of his fellow-students at Padua, one Hoffman, a German, who had not yet accepted his teaching. Harvey called on him and proceeded to unfold to him the necessary demonstration of facts. One can imagine the scene. The cultured Englishman, filled with enthusiasm, eager to convert his old fellow-student, facts marshalled and arguments drawn in his perfect and finished way: on the other hand, the German, uncouth, wrapped in tradition, so far left to himself as to attack rudely the views so clearly laid down by his guest. Does Harvey deign to prolong the discussion? On the contrary, he simply lays down his scalpel and retires from the scene. No altercation, no unpleasantness, just the way an English gentleman would behave to-day under the same circumstances. And this episode is characteristic of his conduct throughout life. The prolonged and bitter controversies which usually appear in the history of any great discovery are absent here. Whatever discussion he makes of his critic's views are always set out in the most perfect courtesy and fairness. That such a complete *bouleversement* of all the ancient views should have taken place with so little opposition is probably due to this trait in his character. It seems to have been so in all the relations of life as well. Not that he was a weak man. The gossiping letters of his young friend Aubrey show him to have been "full of spirit"; he was, "as all the rest of his brothers, choleric, and in his younger days wore a dagger," so that this gentleness towards his opponents arose not from any weakness of character, but from a trait in that character now to be touched upon. He had the easy tolerance of his race and class. As Mr Kipling said on St George's Day recently, "The success of the English is due to their imperturbable tolerance." But he was more than this. By birth and breeding English, by culture and by study he was Greek. We know certainly that he loved the classics, and that Virgil was his favourite author: also that he would always acknowledge the debt he owed to Aristotle, to Hippocrates, and



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to Galen. But when we come to the study of his great work, *de Motu Cordis*, this trait is even more manifest. It is a really great work, this *Exercitatio*. Apart from its importance in the history and progress of medicine, this little work is a masterpiece. In its wealth of closely observed fact it is English; in the easy, terse, insistent flow of its ideas it resembles the thinkers of Greece. It will be noted also that by far the most frequent allusions are to the Greek predecessors, to Galen, and to Aristotle; to his master Fabricius sometimes, the rest very rarely; in fact, we know from the gossip of Aubrey that his opinion of them was not rated too highly. His indebtedness to the great Greeks he always acknowledged. And this leads on to another feature of the work. It is so purely his own. He quotes no one as an authority. He bases all his argument on the observations he himself has made. That these embraced the whole available field is known to you all. From the Molluscs upwards, all the natural orders of animals were dissected by him and used for the purpose of his great argument. And then, the basis of fact being well and truly laid, there follows in clear and orderly sequence one "position" after another until the original apothesis is reached, "that the movement of the blood is constantly in a circle, and is brought about by the beat of the heart."

This, then, was the secret that had for so many centuries been sought by the best and wisest of their times, the hidden spring and motive force that was now set free to act, not only then and now, but far into the centuries yet to come. Here, then, we come to the end; the *ultima ratio* has been pronounced, the demonstration complete. The Master has spoken; it remains for his disciples to work towards completion. Addressing the English-speaking peoples Carlyle has said, "We are all subjects of King Shakespeare." May not the mediciners of every clime and country say the same of Harvey? He was a great Englishman. I have said that he had the Greek mind. May I not go a step further in this company of Scotsmen, and venture to advance the belief that in one respect he resembled the Scottish intellect? In this way. As we have seen, so far back as 1616, fourteen years before he had written his great book, he had arrived at his deduction; and again, in the eighth chapter of that book he says, "I began to think whether there might not be, as it were, a MOVEMENT IN A CIRCLE." He had not the facts on which to base this opinion, for the microscope by which the

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capillaries were first seen was not invented till after his death. His reasoning here was a pure deduction, and this view is supported by a passage in Buckle's *History of Civilisation*, in which he says, "For more than a hundred and fifty years after the death of Bacon, the greatest English thinkers, Newton and Harvey excepted, were eminently inductive. In Scotland men have always been deductive." It was by deduction that the great Scots thinkers, Hutchison and Hume in philosophy, Hutton in geology, Adam Smith in political economy, Cullen in medicine, and John Hunter in surgery made their great discoveries. I do not labour the point. Polemics are out of place at the shrine of Genius. Be his mind English, be it Greek, be it Scots, it rules us all. We are all subjects of King Harvey.

And so, in the foreground of that lurid picture of those seventy years of English History, from the Armada to Marston Moor, from Drake to Cromwell, there passes before us the calm, indomitable spirit of this great Englishman. Informed by a passion for truth, impelled by the instinct of genius, dedicated to the service of man, he moves across the stage to the Valhalla of those who

"Praise their God for that they served His World."

He rests, that quiet Shade, his work is done. But the foundation which he has laid remains, and on it is building and shall be built a glorious structure; and generations yet to come shall follow us in praise of him and in thanking our God that in his own time, and for the good of humanity, he created the immortal spirit of William Harvey.

REFERENCES.—<sup>1</sup> W. F. Smith, *Rabelais in His Writings*, p. 16. <sup>2</sup> Tilly, *F. Rabelais*, pp. 29, 30. <sup>3</sup> *The Scot Abroad*, p. 257. <sup>4</sup> *Gargantua*, Bk. i., chap. xxi. <sup>5</sup> *Pantagruel*, Bk. ii., chap. viii. <sup>6</sup> W. Besant, *Rabelais*, p. 71. <sup>7</sup> *Pantagruel*, Bk. ii., chap. xxx. <sup>8</sup> *Gargantua*, Bk. i., chap. xl. <sup>9</sup> *Pantagruel*, Bk. ii., chap. ix. <sup>10</sup> Saintsbury, *History of Fr. Novel*, vol. i., p. 124. <sup>11</sup> *Epictetus Disc.*, Bk. iii., chap. iii. <sup>12</sup> *Sartor*, Bk. ii., chap. viii. <sup>13</sup> Osler, *Counsels and Ideals*, p. 39. <sup>14</sup> *Autocrat*, iv., p. 87. <sup>15</sup> *Elsie Venner*, p. 281. <sup>16</sup> *Ibid.*, p. 150. <sup>17</sup> *Autocrat*, ix., p. 201.

## FUNCTIONAL MENTAL ILLNESSES.

THE MORISON LECTURES, 1920.

By R. G. ROWS.

*(Continued from page 177.)*

### III.

WE have endeavoured in the preceding lectures to indicate some of the interactions between one portion of the nervous system and another, to show that the reactivity of the nervous system may be modified by influences arising from within and from without and also to suggest a series of mechanisms on the function of which our psychic activity depends. To-day we must consider some other factors concerned in the production of functional mental illnesses.

At any given stage of our lives we are the result of all the experiences, physical and mental, which have affected us since birth and possibly also during the earlier stages of development. Monakow has pointed out that the mechanism which subserves a given reaction during the first weeks of life is the mechanism which must serve for any similar reaction during the remainder of the life of the individual. The various mechanisms, or aptitudes of mind, as Professor Elliot Smith terms them, which exist in all members of the human race are the means by which adaptation to the surrounding conditions becomes possible and their specific expression is determined by the individual's personal experience and by his environment. And if the threshold of some of these mechanisms should be lowered by repetition of stimulus or by any influence which can affect the reactivity of the nervous system, not only, as we have seen, will the appearance of particular psychic states be facilitated as regards a special stimulus, but all other experiences which could make use of the final common path will combine with it and will produce an intensification of reaction by the summation of all stimuli for which the mechanism concerned is adapted.

It is not infrequent, therefore, in examining cases of mental illness, to find the patient going back through his life and revealing instance after instance in which a given type of emotional reaction, such as fear, anxiety or remorse has



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oppressed him as the result of experiences he has lived through. The patient already mentioned who was in a state of great distress and said "I must have a baby," produced during examination a long list of episodes experienced since her girlhood, any one of which was capable of inducing grave anxiety. Her home was disturbed by dissensions occurring between her parents; her favourite brother died on her wedding day; her husband paid more attention to his business than to her; two children died during the first few years of married life and the third child showed more affection for the father than for her; her mother became melancholic and finally committed suicide; her elder sister subsequently became insane and was taken to an asylum and she herself, because of the anxiety and depression which overtook her, lived in a condition of dread as to what the future might contain for her. Need there be any surprise that with the sum of all these unfortunate conditions frequently recalled to memory, the threshold of reaction along a special path was lowered and an intense degree of mental disturbance produced?

It is most important that the influences of childhood should be investigated in order to gain a knowledge of the preliminary conditions which may lead eventually to a mental breakdown. One case, in which the history was taken back to incidents which occurred in the twelfth year, was obliged to leave the hospital before his recovery was completed. When I met him some months later he informed me that there were two other incidents which he had remembered after he left me which he felt might have had something to do with his illness but which he had not recalled while under treatment. One of these he dated at his tenth year and the other at his fourth year. It was interesting to find that these experiences were an earlier edition of those which he had already mentioned to me as being the cause of his serious illness. What is important was that many months after he had been under treatment he should himself recognise that these incidents could possibly, at the early period referred to, have helped to pave the way for his later illness. Another case in which a painful experience at an early age determined a peculiar reaction throughout life was that of a man who attained the position of regimental sergeant-major in a crack cavalry regiment. He was born in India and his father died when he was four. About a year later his mother married again. She placed the child in one of the

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Government schools provided for the children of British soldiers. Having placed him there, she neglected him in every way. He remained at the school for his holidays; he received little money and rarely saw his mother. He felt he could not mix comfortably with the others because he could not return any courtesies received, and he therefore became exceedingly reserved and solitary; this condition persisted even after he had married quite happily, so that if he had two or three days' leave his great wish was to go off alone amongst the hills. This was maintained up to the time he returned from France and came under treatment as a depressed, irritable, solitary, uninterested man. While talking to him one day about his solitary condition and telling him of the remark of a schoolmaster that if a boy was seen avoiding his fellows, standing in corners and not playing as a healthy boy should do, he suddenly interrupted me by saying, "Now I think you are getting near it, sir," and gave me the above history.

One more case which shows how an unpleasant experience can alter the disposition of a boy is that of a patient who when twelve years of age was told by a schoolfellow that he "abused himself." This happened to be true but he had not the faintest idea how his schoolfellow could have discovered it. He was intensely worried and gradually developed a sense of shame and a lack of confidence which interfered with his social relationships to a great degree. He wondered whether there was anything in his general appearance or in his physiognomy which could inform those around him that he indulged in the habit; he was therefore afraid to approach a group of people lest some member of the group should recognise his weakness in that direction and should make a similar remark to him. It is easy to understand how his mental outlook and, in fact, his life generally became narrowed.

The histories of these cases therefore show that unpleasant experiences and their frequent recall in memory can interfere with the mechanisms underlying mental activity, alter the power of the patients to adapt themselves to reality and render them more sensitive to any trying episodes that may follow later.

But sometimes associated with these psychic causes, or preceding them, we have to recognise the activity of certain physical influences. Intoxications, such as are produced by the specific fevers and other illnesses or by poisons ingested, such as alcohol or lead or by infections, such as syphilis, may lead to

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modifications in the nervous tissues, as we showed in the first lecture and thus give rise to altered functions. Pathogenic agents such as these may produce their results through two channels, either directly through their noxious influence on the elements of the central nervous system or indirectly through the nervous mechanisms governing the vaso-motor system which is also so closely associated with the endocrinic glands. Experimental and clinical evidence has proved how readily deleterious effects may be produced on the nerve elements and their functions disturbed by one or other channel.

The importance of the vegetative nervous system and the endocrinic glands in regard to the carrying out of the functions of the different organs of the body is now being recognised. Recent research has demonstrated that the growth and metabolism or nutrition of the body is governed by the secretions provided by the endocrinic glands. In a paper read before the British Association in 1919 Professor Keith suggested that such important functions as the determination of the chief racial types, the Negro, the Mongol and the Caucasian was possibly due to the special action of different endocrinic glands. The differentiation was caused through some morphogenetic mechanism, to use a term suggested by Professor Gley of Paris, which under the influence of a special endocrinic gland stimulated growth in some particular portions of the body. It is also to be remembered that these types possess well-marked characteristics of mind as well as of body and in their formation the environment would play an important part.

Experiment and clinical evidence have shown that psychic reactivity can be modified by changes in the secretions of these glands. For instance, disease of the thyroid gland is accompanied by tremors, increased emotivity and altered mental activity, and the administration of extracts of the thyroid gland will correct the physical and mental disabilities to a certain degree. Removal of the parathyroid bodies is followed by an increased reactivity of the nervous tissues which is recognised in the clinical picture of tetany. Alterations in the other glands give rise to other syndromes. Several glands may be affected at the same time or an alteration in the secretion of one gland may modify that of another and peculiar complexes of symptoms may arise. Moreover, it is now known that not all the glands develop their functions at the same period of life. There are definite times when the glands governing the



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vegetative life show a special activity, and at other times or other ages the glands which affect the life of relation play a more prominent part. If therefore anything occurs to interfere with the harmonious development of the body in all its aspects, difficulties may arise. Is it not possible that some disharmony in the organisation of those physical organs may be one of the factors concerned in the production of some of the difficulties about which so much has been heard during the last few years? But, as Professor Gley has stated, not enough is yet known of the secretions of these glands in health and disease to justify any dogmatic statement with regard to the disturbances which confront us in such great variety.

But the observation that the reactivity of the nervous tissues may be modified by the altered activity of the vegetative system and the endocrinic glands is only one side of the picture. There is another and equally important fact to be considered, and that is that the activity of these glands may be modified by psychic influences.

Experiment has shown that intense pain is followed by an increased secretion of adrenalin through the activity of the sympathetic system. It has also been proved that adrenalin is a stimulant to the nervous tissues of the sympathetic system and therefore the augmented activity of this system will lead to further secretion of that substance. But probably emotional states generally produce alterations in the secretions of the endocrinic glands and if it is correct to assume that the altered secretions affect the reactivity of the central nervous system we may imagine a series of vicious circles being established, emotion giving rise to excessive secretion and this in turn producing an increased reactivity of the nervous tissues; and once established they can be maintained by repetition of the emotional state. This process therefore may be an important cause of the chronicity of a mental disorder. And, if the disturbed emotional states lead to such considerable alterations in the activities of the endocrinic glands and of the vegetative nervous system, it will easily be understood that removal of the cause of the emotional disturbance will at the same time allow the glands and the vegetative system to recover their normal function.

Now in these cases I have submitted to you it has been seen that some important incident in the experience of the patient with which an intense emotion was associated at the time of its occurrence has been stored up in memory. This memory with

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its emotion has been frequently recalled or the emotional state has been aroused by stimuli from without or from within. The physiological result of this repetition must be that the mechanisms which have been so often associated in these reactions acquire a tendency to pass into activity on the receipt of small stimuli which in the ordinary way would produce no result. Habits have been formed, and we must remember that habits of mental activity can be acquired as readily as habits of physical activity and by the same process, viz., by repetition. To use a physiological term these activities may be said to be facilitated and at the same time all other paths but those concerned in the reaction are inhibited. They become paths of less resistance, extraordinarily sensitive and capable of being thrown into action on the slightest stimulus being received. In fact, the reaction may become almost automatic.

We have seen also emotional states arise without the memory of the original cause coming into consciousness, but even when it does appear the mechanisms by which it can produce the disturbance are not known by the patient and the relation of cause and effect is not comprehended. This is a most important point. The lack of knowledge of the mechanisms concerned in mental processes allows a state of anxiety to arise which the patient is often quite incapable of overcoming. And really it is difficult to see what he can do to help himself if he has no conception why a given idea should so frequently recur, why he should more and more find himself in an emotional state without obvious cause. The suddenness of the emotional outburst frightens him. A patient may be playing a game of cards or a game of billiards and suddenly he will throw down the cards or the billiard-cue and leave the room without saying a word, without really knowing why he does it; all he is aware of is that he suddenly ceased to take an interest in the game, that his attention has wandered, that he feels miserable and can no longer remain.

With regard to many of the physical disabilities which might happen to him he would have some idea of what had occurred and what he had to do. If a bone had been fractured by a bullet he could realise the relation of cause and effect. If he had a pain in the stomach he would try to think of what he had eaten that could upset him and he might adopt suitable remedies. But if he has a "pain in his mind," if emotional

outbursts overtake him and he "loses himself" for a time, as it is so frequently expressed, it is a mystery to him ; he cannot conceive why such a disturbance should occur and therefore no means of dealing with it will suggest itself to him. He will simply be compelled to seek some diversion, "something to occupy my mind" as they say, or he must endure until the emotional state wears itself out. Sherrington has pointed out that nervous mechanisms cannot remain in action indefinitely, especially those on which the elaboration of the process depends. But if the original cause in these cases is allowed to remain unexplored and unexplained it will remain equally potent and ready to act again when the necessary stimulus is provided from within or without.

That lack of knowledge of mental mechanisms is responsible for the persistence of many of these mental disturbances is seen in a man who, when the medical officer had explained the mechanisms to him, said, "Now I understand ; every time I receive a letter, a message, or an unexpected order I feel my heart beating, I become short of breath and very depressed. While I was in the trenches a telegram was handed to me informing me of the death of my mother to whom I was greatly attached. This was a great shock, and now every time I receive a message I have a similar feeling." The phrase "Now I understand" is significant, and this man after gaining some insight into his condition and its causes ceased to suffer from the emotional disturbances which had repeated themselves so frequently.

Another patient who had lived through experiences of a peculiarly unpleasant character, said, "Why am I so nervous and frightened? If a knock comes to the door I have a feeling of anxiety ; if I receive a letter I don't like to open it, fearing what the contents may be ; I hate answering the telephone because I dread what may be said." What a number of stimuli have acted in this case to develop such a reaction and are still being received every day to maintain it ! But after an explanation had been given he could talk of it to me without any anxiety or dread arising. His question, "Why am I so nervous and frightened?" indicated his lack of knowledge, and, in fact, his condition of anxiety depended on it.

There is one more point to mention in connection with these emotional states, and that is, that the emotional reactions are always specific and if the emotions constitute an extremely



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important factor in our defence mechanisms, they must be specific and unalterable in order that the organism may be adequately protected.

Let me give you an instance in which, at first sight, the emotion described by the patient seemed to be the opposite of that which might have been expected. A man had a dream that he saw a collision between two motor cars. The collision took place on a bridge over a river and in the dream he saw one woman amongst several men. He heard the remarks "Shoot her," "Kill her"; then he saw her seized and bound with ropes preparatory to being thrown into the river below. He awoke and found himself laughing heartily and enjoying the incident. This emotional reaction appeared to be completely unfitted to the contents of the dream until it was discovered that this scene had been played in the production of a cinema film. The men were a gang of burglars who had been discovered and followed by the woman and they had to get rid of her to protect themselves. Another instance was that of a man who dreamt that he was quietly driving some cattle and sheep along a lane towards some fields in which a butcher stored the cattle just before he killed them. There was nothing unpleasant in this, but the man awoke in a state of terror. On investigation it was found that during his illness he had been very tempted to cut his throat and he scarcely dared to take a knife in his hands. As he had used knives to kill animals when working for the butcher the dream of driving the cattle along the road, innocent enough in itself, had by association sent him into a state of terror which was connected with his thoughts of suicide.

In these two cases, therefore, exploration demonstrated that though apparently incongruous the emotional reactions were really correct and appropriate. It is a question whether an abnormal emotional state can occur; the degree may be excessive but the emotion is never abnormal in kind.

In the cases already mentioned a stimulus which could remind one patient of a gas attack, or another of a shell which buried him and killed three companions, could not produce an emotion other than terror. The time stimulus took other cases back to illness, to an attempt to commit suicide, to memories of a terrorising and depressing nature and could not but be followed by emotional states similar to those experienced at the time of the original incidents; reminders

of the numbers "thirteen" and "seventeen" could not but give rise to the specific emotions originally associated with the unpleasant incidents which had occurred to the patients years before. And if it be admitted that the law of determination holds good in regard to psychic experiences as well as to physical phenomena, that every thought, every emotional reaction, is the result of some stimulus either from the external world or from some internal mechanism, we may be able to realise how the disturbances mentioned in the examples already given can arise and why they have assumed their specific form. The man who is upset by the sound produced by a tin can falling is indifferent to the number "thirteen"; the patient who reacts to the time stimulus is not affected by the thought of what a letter may contain. But in each case the specific form of reaction is the result of some personal experience, with which is associated an emotional reaction, and which stands in the relation of cause to the effect produced.

Until comparatively recently the role of the emotions in mental phenomena was little understood and received little attention. Research during the last few years, however, has lifted the veil, and the importance of the emotions in determining thought and behaviour is now recognised.

Now from our own experience we know that where the emotions are there the attention will be. We have all felt on various occasions that there is an unusual difficulty in keeping our attention fixed on a given subject and on analysing this we have generally been able to trace out the cause which disturbed us.

An interesting instance of this is seen in the case of a man who asked that he might have some spectacles.

"Why do you require spectacles?"

"Because after I have been reading a few minutes the lines all run together."

"Do you notice that when the lines run together your attention has wandered from the book?"

"Yes."

"Do you find at such times that you are looking through the book and not at the page?"

"Yes, and I see a face on the other side of the page every time."

"What face is it?"

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"It is the face of a man who insulted my wife and if I ever meet him I will do him in."

This man would sit for hours with his elbows on his knees and his head in his hands, oblivious of what was going on around him; he was depressed, irritable, incapable of giving attention to ordinary occurrences in the world around him, and he was the victim of disturbed sleep and exciting dreams. That meant that an emotional state would suddenly appear and would dominate him; his attention became ego-centric, he failed to perceive what was happening, to interest himself in his surroundings. Sometimes he grew restless, quarrelled, and was abusive. One interesting fact discovered on investigation was that the offending man was in America, that is to say 3000 miles away and among 100,000,000 people. This, which made the chances of his meeting his enemy infinitesimally small, was not heeded; when in the emotional state all outside mental activities were inhibited; long repetition of this process had made him react too easily so that any slight stimulus, of external or internal origin, could determine the appearance of this circumscribed condition.

It is obvious, therefore, that we have in this case an illustration of the way in which the repeated recall of an incident, which was stored up in memory, led to a reaction which as time went on became more and more easily produced. This illness did not appear suddenly and it is probable that no mental illness ever does commence suddenly. The remarks made by patients demonstrate this. Such a statement as, "It was when I was getting stronger that this came on," shows that the patient appreciated the gradual onset. In his case he, while in France, acted on one occasion so that he was led to call himself a coward, but really there was no sufficient reason for him to accuse himself of cowardice. He became miserable at the thought of this, and exposed himself to danger unnecessarily in order that he might be killed. Finally he was blown up and passed into the conditions of exhaustion and confusion which usually characterise the early effects of such an accident. But it was when he was recovering from this and was in a condition of weakened control that the emotional state connected with the memory of the unpleasant incident gained a dominating influence over him, and, as he informed me, "it was when I was getting stronger that this came on."

A case in civilian practice was that of a man admitted



to an asylum in a most acute hallucinatory condition. "Hallucinatory voices" tormented him to a terrible degree. Exploration showed that these "voices" had commenced to disturb him at least twelve months before. At first they appeared when he was trying to go to sleep. Gradually they invaded more of the night but did not occur during the day. At last the hallucinations disturbed him during the day and naturally his altered behaviour became manifest to those around him and he was sent to an asylum—twelve months after the commencement of his illness.

But long before the behaviour is so altered that it is obvious to those around the patient, he himself recognises that his mental processes are not under proper control. He feels that his capacity to see and hear, to think and feel, to judge and act is not what it was; he cannot give attention to ordinary affairs but notices that without any apparent reason his attention wanders from what he was doing, that he loses himself as it is so frequently said. He is unable to adapt himself to his surroundings; he becomes restless, irritable, and anxious, seeks diversion, loses confidence in himself, cannot mix with his fellows comfortably and with pleasure. With these mental alterations there are associated certain physical manifestations of emotional disturbance. Each emotion is accompanied by a series of physical reactions. Probably all emotions give rise to some change in the vascular and respiratory systems, but physical signs may also be connected with the digestive apparatus, the sweat glands, the bladder, the rectum, the muscles; in fact, depending on the degree or intensity of the stimulus almost every organ of the body may be affected, including the nervous system itself. The organs to be affected and the extent of the disturbance in them will depend not only on the intensity of the stimulus but also on the reactivity of the nervous structures; and this in turn will be influenced by the frequency of repetition of the stimulus and also by changes produced in the vegetative nervous system and the endocrinic glands.

A description of his mental state by one patient is interesting:—After a pause during an interview he suddenly said, "I am conscious of my madness. Yes, I suppose I must say that; I do not feel I am in my own mind. I come in from work at tea-time. After tea I say, I will play a game of cards; no, I won't. I will write a letter; no, I won't. I

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can't sit still; I must, like I am now, always be shaking my leg or tapping the table. My mother complains I don't answer letters. I get a letter and say I will answer it to-morrow. To-morrow I don't do it, and I may not do it for a fortnight. All the time I do not have an hour's peace. At last I force myself to sit down and write a couple of lines. This means that I have got to feel so bad that I can't do anything but write it. Other times I feel so bad that I could kick things, break things, or that I must have a row; and then I am better and can go on again. Then it gradually begins again. I cannot give my mind to what I want to do; my attention goes." In several of these moods he has lost control of himself, has cursed the nurses, has been violent and thrown a jug at, or struck a patient, or has wandered out and stayed out late. Further he stated: "If I go out alone I am miserable. I have for years felt that I wanted someone to rely on, for years I have not been able to face things alone." On another occasion: "Suppose you have done wrong, it comes up to you; I never knew it was possible to have suffered as I have done; I have tried to keep it down." Here in the patient's own words we have an illustration of the condition of a mind in the early stages of a mental illness.

So many patients in whom the illness has advanced will refuse to admit that they are mentally disturbed. An admission such as that just given shows that the man had not altogether lost his sense of proportion and that his illness had not become systematised. He recognised that he was ill and he was in a very anxious condition because he feared as to what the final result would be.

This is the period when there will arise a serious anxiety as to what the illness may mean. There is a loss of confidence in himself and a dread as to what may follow. The only conception which he has of a mental illness is that it is connected somewhat intimately with the legal terms "lunacy" and "asylum," and as he knows nothing of mental processes and has a grave fear as to where this disturbance may lead he soon develops a dread which will be renewed on every occasion that he feels the disability. This dread is very real and is often hidden for a long time because of the fear of possible consequences. The patient therefore becomes introspective and is driven to watch every sign which can possibly suggest that all is not well with him and which can confirm

his fear. In one case a man in an asylum when asked "How are you getting on?" replied, "I don't know, sir; yesterday when I got into a hot bath I noticed that my skin was all 'goose-flesh.' What does that mean? How has that come about?" Now this man must have had "goose-flesh" whenever he had entered a hot bath, but, because of his mental disturbance, because he had been forced by the dread of what was happening, to become introspective and to be on the look-out for confirmation of his fears, he attached undue importance to this normal phenomenon and found in it a further proof that he was doomed. With the repetitions of this sort of thing he was forming and confirming a habit of thought which he could not overcome and which, in fact, did dominate him.

There is no new mechanism which comes into action in the production of mental illnesses. The man who is suffering is responding to a series of disturbing stimuli with which intense emotional states are associated. Because of the intensity of the emotional states and of the action of the various other factors to which we have referred he is no longer able to exercise that harmonious and successful control of the infinitely complex processes which underlie mental phenomena. His mental reactions become disturbed and confused and the results of this disturbance of the mechanisms of perceiving, thinking, feeling and acting constitute the earliest stages of all functional mental illnesses. These are the primary changes which make it difficult for the patient to appreciate reality, to give attention to the manifold changes within and around him, to judge of the value to be attached to them and to adapt himself to them.

We suggest, therefore, that all functional mental illnesses in their primary stage are the result of emotional states depending on conflicts produced by some experience or series of experiences occurring in the life of the individual. Further, that the symptoms of such disturbance are those which would be expected if the facilitations and inhibitions which render clear consciousness and co-ordinated action possible are out of action or out of gear, or if they are replaced by other facilitations and inhibitions not in themselves necessarily abnormal but able to impede the ordinary processes of perception, attention, feeling and action.

Freud in his work on *Hysteria and other Psycho-neuroses* says: "In those patients whom I have analysed there existed psychic health until the moment when an incompatibility



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occurred in their ideation, that is, until there appeared an experience, idea, or feeling which evoked such a painful effect that the person decided to forget it because he could not trust his own ability to remove the resistance between the unbearable idea and his ego." Again: "The defence of the unbearable idea was brought about by the separation of the same from its affect: the idea though weakened and isolated remained in consciousness. There existed, therefore, a far more energetic and more successful means of defence whereby the ego displaces the unbearable idea with its affect and behaves as though the unbearable idea had never approached the ego. But at the moment that this is brought about the person suffers from a psychosis which can only be classified as an 'hallucinatory confusion.'"

Freud in these two paragraphs suggests that the basis of what are known as the Neuroses and the Psychoses is some altered affective state which has been produced by an unbearable idea.

The primary result in each instance is a disturbance of the capacity to perceive, to think, to feel, to judge and to act. This in itself is sufficient to produce a condition of anxiety, and, if the patient is left unexamined and untreated, the persistence of his disability cannot but give rise to a sense of dread as to future developments.

This is the period when he will commence to seek for an explanation of his condition, and, as he lacks any real knowledge of mental mechanisms which might assist him, he is open to suggestion and adopts as a possible explanation ideas which to a superficial observer may appear bizarre and absurd, but on investigation many of them are found not to be so mad as at first they appear.

There is always an atmosphere of mystery about subjects and objects of which we have no knowledge, and it need occasion no surprise, therefore, that a patient in a confused, anxious state such as we have described, should attribute his disability to causes or agencies which he would not accept as adequate if he were in a normal condition. His field of consciousness is so narrowed that he is unable to submit any idea or explanation which may occur to him to a judgment based on the whole of his past experience. He is therefore open to suggestion from without and from within, from what he hears, from what he sees, from what he feels, from what he reads, from what he thinks, from what he dreams.

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The type of result produced will depend not only on the suggestion adopted but also on the mental tendencies the patient has developed from the time of birth onwards and on the sensitivity and reactivity of his nervous mechanisms.

These secondarily produced phenomena constitute the symptomatology with which we are familiar in the fully developed disturbance as seen in our ordinary clinical experience and which is detailed so carefully in the text-books. It is on these later and secondary symptoms that we are accustomed to base the differentiation into the clinical entities hysteria, psychasthenia, neurasthenia, the phobias and obsessions, melancholia, manic-depressive conditions, epilepsy in many instances, paranoia and the so-called dementia præcox, that is all those conditions which are to be included under the term "functional mental illnesses." But they are all secondary products, and the form which the illness may take will depend on the action and interaction of all the influences which have been referred to in these lectures.

We need not therefore discuss so much the differences between the neuroses and the psychoses, nor why the neuroses so seldom develop so as to become psychoses. Looked at from the point of view which I have endeavoured to place before you there is no reason why a neurosis should become a psychosis; and if a psychosis should develop we must look for the action of some fresh cause or some further weakening of the control of the facilitations and inhibitions, or possibly for some added morbid activity of the endocrinic glands.

But the primary stage in the functional mental illnesses is represented by the disturbed capacity to perceive, to think, to feel, to judge and to act, and by the anxiety and dread which naturally follow such a disturbance. During this stage recovery is possible in the great majority of instances if not neglected, and therefore these illnesses need not be regarded with such feelings of helplessness and hopelessness as have prevailed up to the present day.

## THE INTERDEPENDENCE OF THE SYMPATHETIC AND CENTRAL NERVOUS SYSTEMS IN RELATION TO THE PSYCHONEUROSES.

By DAVID ORR, M.D.

IN a previous communication<sup>1</sup> evidence was brought forward in support of the view that in studying nervous diseases, and especially those presumed to arise as a result of some defect in the cerebral mechanism, one should invariably bear in mind the intimate anatomical and physiological relationships which exist between the cerebro-spinal axis and the endocrino-sympathetic system. Up to within recent years the attention of those directly concerned with mental illnesses has been focussed on the cerebral cortex, and most investigations have been carried out on cases whose chronicity defeated all efforts at elucidating etiology. This has been common knowledge for a long time, but the last five years have been of inestimable value in enabling us to recognise that a mental illness is simply a disturbed physiological process in which by early appropriate treatment the prognosis is quite good, and whose neglect inevitably leads to "certifiable insanity." Observations during these last five years have served to convince us that though the manifestations of insanity are psychic, yet they must be investigated along physiological lines and not from the detached and introspective plane of the pure psychologist. Mental illness, of course, is a disorder of the nervous system, but nervous tissue depends entirely upon the healthy work of all the other body organs for its physiological integrity. And the central nervous system is not an independent unit. It has special reciprocal relationships with the vegetative nervous system; and the vegetative nervous system controls the humoral action of the ductless glands; hence it is clear that the whole nervous system, central and vegetative, constitutes one single physiological unity, and that disturbance of any one part of the system must inevitably react on the entire mechanism. This point has been well exemplified by the psychoneuroses of the war, whose clinical symptoms were primarily the result of emotional disturbance. Now emotion invariably finds its expression in a variety of "sympathetic" symptoms; and these were the most prominent physical signs of psychic trauma. This physical



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reaction to psychic trauma is now recognised as of much greater importance than was previously thought. It embraces disturbances in various portions of the endocrino-sympathetic system which are in many cases persistent and tend to maintain or aggravate the faulty mental mechanism.

What follows are the principal arguments in support of the view that a mental illness is a physical disease the result of disturbance of the nervous system in its entirety, and the ductless glands under its control. The term "psychoneuroses" will frequently be used, only for want of a better one and in its widest sense: and the term "constitutional" as applied to a disability is meant to designate one existing in the adult, not by any means necessarily of an hereditary nature but which may have been acquired in utero or in early childhood.

The classical researches of Gaskell, Langley, and Elliott<sup>2</sup> have placed our conception of the vegetative system upon a secure basis. The sympathetic nervous system—using the term in its broadest sense—is now known to consist of two portions which are functionally antagonistic. One, the true sympathetic, consists of the vertebral and intra- and extra-visceral ganglia, with communicating nerves to the centres in the spinal cord; the other, known as the autonomic system, springs from two sources, cephalic and spinal, and its nerves reach their destination via the 3rd, 7th, 9th, and 10th cranial nerves, and the 1st, 2nd, and 3rd sacral nerves. The rôle of this involuntary nervous system is to regulate organic and nutritional functions, and to maintain functional relationships between the various organs which subserve them: and for this reason it has been termed the nervous system of the life of nutrition.

As mentioned above, the sympathetic and the autonomic systems are antagonistic and have been shown to be so by pharmacological tests. Normally they should be in a state of equilibrium. Both are in close anatomical relationship—by nerve fibres—with the ductless gland or endocrinic system, and exert a neuro-secretory action upon it. At the same time experiment and clinical medicine have demonstrated that the secretions of the endocrinic system exercise a powerful influence on those involuntary nerves, and that in an elective manner. For example, adrenalin stimulates the sympathetic system; infundibulin, the pelvic nerve arising from the first three sacral nerves; thyroidin, the vaso-dilators of the heart, accelerators of the heart, and the autonomic system. This involuntary

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system of nerves, therefore, is so closely linked, both anatomically and chemically, with the ductless glands that modern writers now employ the comprehensive term of the endocrino-sympathetic system. The tone and excitability of the whole sympathetic system is regulated by the gland secretions or hormones which are poured into the blood, thus maintaining equilibrium between the two sections.

But in the endocrinic glandular system there are complex and special correlations: special relationships of synergia or of antagonism, so that for a perfect equilibrium of the sympathetic and autonomic nervous systems there must be perfect harmony of interglandular relationships. This is necessary for the trophic equilibrium of the organism, and one can readily understand how the prevalence of hormones governing one division of the nervous mechanism will raise its tone above that of the other, giving rise to morbid action on the part of the endocrino-sympathetic system. Over-action or defect on the part of the various glands may be acquired or constitutional, and the point of departure of the morbid state may be either in the nervous or glandular division of the system.

The vegetative, involuntary, or sympathetic nervous system regulates growth and development. This trophic action exerts its influence by means of a reflex mechanism, whose arc in its first portion is formed by sensory fibres from the skin, the mucosa, the serous membranes, the various viscera and tissues of the vegetative life, and their more important trophic centre is situated in the spinal root ganglia. The integrity of the ganglia and of all the sensory path is necessary for the nutrition of the tissues. But in addition to this reflex function the sensory path transmits to the central nervous system those subconscious impressions which control the rhythm of the vegetative life; subconscious impressions which, however, become conscious and are resented by the higher centres in pathological conditions. When the sensory path becomes more pervious, and stimuli, though normal, pass more easily or in greater quantity, then more intimate relationships between organs and the cerebral cortex become established. Stimuli of more than normal strength with the path not more pervious can bring about a similar result. And hence stimuli originating in the organs of vegetative life impinge on consciousness as bodily "sentiments," tendencies, or instincts, thus playing a most important part in the formation of the psyche. On the other hand, it is of the utmost

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importance to remember that psychic changes can exercise a great influence on the action of the vegetative system, an influence which is constantly observed to take place in certain morbid mental conditions.

It was at one time held that the sympathetic system was absolutely autonomous, that is to say entirely independent of control on the part of the spinal cord and brain. Such a view is quite untenable nowadays. It is most probable that there are "sympathetic" centres in the grey-stem. We know for certain they exist in the spinal cord, the intermedio-lateral tract, and there is growing evidence to show that they exist in the cerebral cortex also. Bechterew's<sup>1</sup> view is that in the cortex there are so many sensory-motor areas with psychic functions, and that each area is composed of a receptive centre functionally and anatomically connected with a neighbouring efferent area, thus forming an organic neuro-psychic unity. Sympathetic centres are intimately connected with these, and take part in all psychic and psycho-sensorial processes, and thus it is easily comprehensible how the sympathetic system becomes involved in neuro-psychic activity. And although there are no known special cerebral paths of sympathetic fibres linking up the psycho-sensorial zones with the lower nuclei in the pons and medulla, that is no argument against the view that the cerebral cortex influences the lower sympathetic centres. Müller<sup>3</sup> points out that the different emotions of psychic states produce some alteration in the biotonus or capacity of nervous discharge of the different bulbar, spinal, or sympathetic nuclei, according to the nature of the emotion, and therefore no special paths are necessary beyond the cortico-bulbar and spinal. In the same way as during laughter the ganglionic cells of a certain number of muscles (diaphragm, vocal cords, facial muscles of expression) are stimulated without there being "a laughing centre," so he thinks that the different emotions throw different groups of visceral ganglionic cells in the mesencephalon, medulla, cord, and peripheral organs into activity.

It is probable, therefore, that the nerves, both centripetal and centrifugal, which subserve the sympathetic functions are represented not only in the lower centres but in the cortex itself. The centripetal nerves carrying impulses from the vegetative life subserve that sensation known as kinæsthesia—an unconscious sensation, but one of the most important for the organism; while the centrifugal nerves would complete the



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circuit to maintain the nutritional rhythm. It is true that when the sympathetic system is disconnected, experimentally, from the central nervous system it acts, but its action is less energetic than in normal animals; in other terms the equilibrium of life is more labile. Autonomy of the sympathetic system is therefore inconceivable in the sense that it functionates physiologically when independent of the central nervous system.

It must be granted that the will and consciousness have normally no influence on the vegetative system, nor on the organs under its nervous control, and that the threshold of consciousness is not normally passed by stimuli from those organs. Still, the cerebral cortex can, under extraordinary conditions, transmit impulses to the organs of life, and become hypersensitive to the changes occurring in those organs. For example, we are aware that during hypnosis certain functions of vegetative life can be modified: variations in pulse and variations in the secretion of tears, sweat, milk, and urine. Such facts as these demonstrate the existence of centrifugal and centripetal relationships between psychic and vegetative life, which it will be shown later assume a much greater significance in pathological conditions. This relationship is well exemplified by the emotions, which find their physical expression in the reaction of the vegetative system to the psychic stimulus; and it is a matter of everyday experience that the degree of the psychic reaction is reflected in the physical phenomena. Thus we find that intense excitement, or fright, raises the tone of the vagus, while that of lesser degree accelerates the pulse-rate through stimulation of the sympathetic. But emotion finds its expression in other parts of the vegetative system, whose reaction to the stimulus is not always immediately obvious though none the less of far-reaching importance. Gastric secretion can be profoundly modified and even suppressed by psychic stimuli, and there is evidence that the secretion of the endocrinic glands undergoes physiological and chemical alterations under similar conditions. Gôitre can follow psychic trauma; glycosuria was shown long ago to occur as a sequel to puncture of the 4th ventricle, and it is not uncommon, though transitory, in adolescent insanity. There is no reason to doubt that the whole endocrinic system can be influenced by psychic changes. The increased secretion of adrenalin in psychic excitement is now classical, and it has been shown that the stronger the stimulus and the longer it

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acts, the more adrenalin is poured into the blood-stream; and as this substance possesses an elective affinity for the sympathetic nerves stimulating the increased production of adrenalin, it is easily seen how a vicious circle can be established between nervous and glandular action. The relationship between those two, however, is so close that they may be said to act physiologically as one, and form the anatomical basis of the phenomena and sequelæ of emotion. In the light of modern research the psychic stimulus with its ever-present emotional content forms the starting point of the phenomena, and from this modifications of the endocrino-sympathetic system are produced which can influence the general nutrition of the organism, and induce such changes in the central nervous system itself as to facilitate faulty mental mechanisms and tend to the production and maintenance of unphysiological neuronc action. If adrenalin reacts upon the sympathetic system, inciting it to the production of more adrenalin and so producing a vicious circle at a low level, it would be unwise to deny the possibility of a similar repercussion of altered endocrinic function on the neurons of the highest levels, viz., the cerebral cortex. It will be seen later that the psycho-emotional factor is able, in pathological conditions and especially in those whose endocrino-sympathetic system presents deviations from the normal, to produce the most profound vegetative reaction to the psychic trauma.

It is evident from all the above that there are very close physiological relationships between the central nervous system, which governs our life of relation to the outside world, keeping us in touch with our environment in order to adjust our conduct towards it, and the vegetative nervous system which controls our life of nutrition. Such an arrangement of mutual integration is what one would expect from the anatomical unity of the two systems; and although this integration is subconscious under normal conditions, probably in order to keep mentality from interfering with a mechanism in which the pendulum of anabolic and katabolic nutritional processes must never be permitted if possible to swing too freely, still when either system produces morbid stimuli the result is dissociation of function in its broadest sense with definite clinical symptoms. It has been one of the greatest blunders in neurology that hard and fast—though absolutely artificial—lines have been drawn between cerebral, spinal, and endocrino-sympathetic pathology.

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The whole system is an anatomical unity, and we have to thank the obvious and gross disability of the lesion of the nervous life of relation for the present obscurity of the clinical pathology of the nervous life of nutrition. If we determine to look upon the entire nervous system, central, peripheral, and vegetative, as a whole, especially in the study of functional disturbance, I think we shall be much less handicapped in attempting to unravel the etiology of its morbidity. And this applies especially to functional disturbance of the brain.

It is only comparatively recently that the effect of acquired and constitutional anomalies of the endocrino-sympathetic system on the central nervous system, and *vice versa*, has received serious consideration, although the importance of the subject was emphasised by De Giovanni<sup>3</sup> nearly fifty years ago. Studies in the pathology of the sympathetic system have revealed some most interesting facts, and amongst them one of the most important in the etiology of mental illness, viz., that the endocrino-sympathetic plays a great part in the formation of the individual temperament, and therefore of individual reactivity to the external factors which excite disorder of the organism. In both vegetative and central nervous systems the causes of disturbance are the same: there are internal and external factors, but the former predominates in the sympathetic system. "In the etiological sense, the internal factor might be defined as the complexity of inherent factors common to a special organisation, in virtue of which the vegetative system of a given individual shows a special morbidity to occasional causes which would have little value in one whose vegetative system was stable." The best example that can be given of this is the reaction of the sympathetic system in relation to vasomotor and secretory phenomena in pain, fear, or shock. According to the individual reaction a variety of symptoms make their appearance, such as pallor, blushing, sweating in certain regions of the body, icteris after a few hours, loss of appetite, vomiting, bradycardia, tachycardia, acute Graves' disease, acute chlorosis, temporary glycosuria, and suppression of urine. It is clear that the diversity of the symptoms are due to general or local anomalies of the endocrino-sympathetic system: that is to say, a predisposition on account of faulty formation to react to the external exciting stimulus. De Giovanni has gone so far as to assert that the individuals of the nervous diathesis always present more or less evident anomalies of body formation, and



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the more one reflects on the important rôle played by the nervous life of nutrition in the development and maintenance of the individual, the more one must agree with his views. It may appear irrelevant to the student of normal or morbid psychology to introduce such material matter as the anatomical anomalies in the composition of the individual, but the psychologist who is conversant with the anatomy, physiology, and pathology of the nervous system will be the first to admit that one cannot do otherwise if the influence of the nervous life of nutrition upon the nervous life of relation is to receive due consideration. De Giovanni has pointed out how in the constitutional and individual neuroses morphological anomalies are a most important factor in the sense that the nervous system is predisposed to disease on account of its own faulty formation, and exhibits a tendency to react to errors, which occur at various periods of life, in other portions of the organism. He is emphatic in his opinion that individuals presenting the nervous diathesis always show anomalies in relationship with the longitudinal and transverse diameters of the body, of the muscular development, of the subcutaneous fat, of the skeleton, and of the viscera. And the logic of his argument is apparent when one looks at the part played by the vegetative system during development.

It must be noted the two portions of the vegetative nervous system exercise their maximum elective effects upon the individual at different periods of growth. The sympathetic provokes, excites, and accelerates, activities: the vagus or autonomic retards, depresses, or inhibits them. In other words, the former favours the production and expenditure of energy, while the latter ministers to its conservation. Thus growth is dependent on the functional integrity of the sympathetic, while during the regressive phases of life autonomic nervous action is in the ascendancy. Between those two periods, of growth and regression, there is, naturally, a long period in which the activities of the two systems are counter-balanced. This is the period of physiological equilibrium; a period, however, in which one or the other system may prevail in its entirety or only partially as the result of some constitutional or local disturbance, giving rise to individual visceral syndromes. For example, during the period of growth the sympathetic system may be overtaxed, and naturally at once the vagus assumes the ascendancy giving rise to varying pathological phenomena

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according to the degree and site of the sympathetic disability. On the other hand, however, the vagus may be at fault; and thus we find either of two morbid types may arise, the sympathicotonic or the vagotonic, each characterised by distinctive symptoms. It is important to recognise in this connection that there are impure or mixed forms, and that the nervous phenomena of the vegetative system are inconceivable without a contemporaneous endocrinic humoral correlation which integrates and guides the resulting nervous action. This point is very well illustrated by studying the influence of age in relationship to endocrinic development and regression.

There are, in the organism, continual changes from birth to old age, and the evolution and involution of the endocrinic glands during the various epochs of life is of special interest. Each of the endocrinic glands has a special developmental cycle which is strictly related to the physiological development of other internal secreting glands. For example, the thymus gland which is well developed in the foetus, goes on growing until the second year of extra-uterine life, then remains stationary until puberty when rapid regression sets in. The parasympathetic chromaffin tissue which is well developed in the foetus and newly-born infant suffers a rapid regression after birth, and in the adult is reduced to a few cellular groups disseminated amongst the sympathetic ganglia and plexuses. The medullary substance of the adrenal body reaches a higher stage of development after birth, and its structure and function are somewhat different from those of embryonic chromaffin tissue. At puberty the adrenal medullary substance, the follicular glands of the ovary, the seminiferous glands of the testicle, the thyroid and the pituitary glands reach a high degree of functional activity. During this period the limbs, especially the lower limbs, and muscles are growing rapidly, and the secondary sexual characters are making their appearance; visceral development meanwhile lags behind: and all this growth is subordinate to the activity of internal secretion. Thus in childhood a group of hormones is stimulating the autonomic nerves which govern the life of nutrition, while at puberty another group stimulates the development of the life of relation, or that system by means of which we become aware of, and react to, our environment. During growth, therefore, the two systems act alternately. One stimulates growth of the vegetative apparatus and is composed of hormones from

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the pituitary body, the thyroid, parathyroid, the thymus, pancreas, cortical suprarenal, and the pineal gland; while the harmonic group which stimulates the life of relation comes from another series of pituitary and thyroid hormones, from the medulla of the adrenal, and from the generative tissue. The harmony of the development of the two organic systems—the life of nutrition and the life of relation—depends on the equilibrium and rhythmic action of the above two groups of hormones during the various phases of growth; and on this depends the form of the body. The two important periods at which growth exhibits a definite exacerbation are the seventh year and at puberty. And since each of the two glandular groups stimulates a special category of sympathetic nerves, it will readily be understood how in the period of greatest growth of the animal system the tone and excitability of the regions subordinated to the hormones of the pituitary, the thyroid, the genital glands, and the adrenals, preponderates.

It is on physiological lines such as the above that disturbance of the endocrino-sympathetic system at puberty and during adolescence can be explained. Symptoms such as chlorosis, exophthalmic goitre, Addison's disease, or pituitary disturbance, may arise and be purely transitory. In the same way one can explain the elective development of sympathetic syndromes at certain epochs of life—for example, the climacteric in women. Women at puberty are especially predisposed to sympathetic disturbance, and are apt to suffer from neuroses especially if they are of the arthritic diathesis. It is, however, of special interest for the student of functional nervous disorders to note that should there be present in a young or any other person a condition of faulty equilibrium of the endocrino-sympathetic system, then psychic trauma with its concomitant morbid emotional state is in a position to produce its maximum effect.

The principal causes which give rise to sympathetic diseases are psychic trauma, mental suffering, infections, intoxications, and, more rarely, physical injury. In this connection it is evident that infections and intoxications may so undermine mental resistance as to facilitate the morbid action of psychic trauma. But there is a large accumulation of evidence to show that emotion is a most important factor in the genesis of the sympathetic neuroses; and even within physiological limits psychic states can determine changes in the endocrino-



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sympathetic mechanism. It is common to observe after fear or mental suffering the rapid development of chlorosis, Addison's disease, hemicrania, renal neuroses, nervous diabetes, hyperidrosis, angina pectoris, and angio-neurotic eruptions. If we admit—and there is no reason to do otherwise—that the cerebral cortex can exercise an exciting or an inhibitory action on the function of the vegetative system, through the sub-cortical, bulbar, and spinal centres of the sympathetic, then the mechanism of production of the neuroses is patent. The constitutional stability of the entire nervous system is, however, all important. When it is unstable, the instability may affect any one part; and hence De Giovanni holds that there are not so many neuroses, but a neurotic diathesis which can exhibit many clinical forms as the result of a special constitutional organisation. The neuroses, he says, may be originally cerebral and react upon the spinal cord or sympathetic system; or spinal, and become diffused to the brain and vegetative system; or originate in the sympathetic ganglia and spread to the cerebro-spinal axis. There is a vast difference, therefore, in the clinical phenomena.

When one considers the anatomical and physiological intimacy which exists between the vegetative nervous system and the cerebro-spinal axis, it is clearly impossible to conceive of a sympathetic syndrome without admitting, at the same time, morbid complicity on the part of the nervous life of relation. Psychic disturbances, asthenia, atonia, tetany, and other symptoms are constant accompaniments of endocrino-sympathetic disorder. And these symptoms are corroborative evidence that the system not only regulates the vegetative life but the life of relation as well. The modern view is that in all probability the regulation of the trophism of the brain and the voluntary locomotory apparatus is dependent on the fact that the endocrinic hormones favour or inhibit the exchange of determinate substances which are indispensable for normal function. Thus lipoids from the cortex of the suprarenals are necessary for the normal function of the brain; while calcium, magnesium, and glycogen, whose exchange is regulated by the hormones of adrenal, thyroid, parathyroid, and thymus, are necessary for the physiological function of the striated muscles and their centres. There is a considerable consensus of opinion now in favour of the view that alterations of the endocrino-sympathetic system are responsible for certain obscure affec-

tions of the muscular apparatus (progressive muscular atrophy, myotonia, paralysis agitans), and also for certain forms of dementia and delirium.

Within recent years the importance of endocrino-sympathetic stability and its relationship to individual reactivity has received a great deal of attention through the researches of Eppinger and Hess. The issue raised by them is one which involves the relative balance between the two portions of the vegetative system, viz., the autonomic and true sympathetic. These two authors have demonstrated that, in subjects sensitive to pilocarpin, the tone of the whole autonomic system is raised; and that clinically this constitutional hypertonicity gives rise to symptoms such as gastric hyperacidity, physiological bradycardia, slight respiratory arrhythmia, eosinophilia, spastic constipation, and a tendency to hyperidrosis and salivation. This condition is known as vagotonia, and readily passes beyond physiological limits. There is another class of individuals in whom the true sympathetic system is hypertonic and who can be classified as sympatheticotonic. This scheme rather suggests an unjustifiable rigidity, and has been criticised by Castellino and Pende, who, however, accept the thesis with certain reservations. They point out that adrenalin, a sympatheticotonic substance, may show that certain parts of the sympathetic are more susceptible according to the individual; and the same argument applies to thyroïdin, pilocarpin, and atropin: that is to say, that by means of hormonal action a dissociation of physiological reaction may be produced. In addition to that it is found that an individual may show hypertonia of one portion and hypotonia of another portion of the same system, and further, that a condition of mixed vagotonia and sympatheticotonia is not infrequently met with. These observations argue very clearly against a rigid scheme of classification; but at the same time they emphasise the important part played by faulty balance of the vegetative system in the determination of individual reactivity to an exciting cause, or, in other words, temperament.

The influence of this reactivity upon psychic life is quite apparent within physiological limits, and under morbid conditions it comes prominently into view. The study of the "war psychoneuroses" has shown most profound reactions of the endocrino-sympathetic system to psychic trauma; and these reactions vary, not only in individuals, but according to the susceptibility of certain portions of the vegetative system,

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causing a large variety of symptoms. But the morbid train of circumstances does not end there. The psychic trauma with its emotional content produces certain changes in the physiological mechanism of the endocrino-sympathetic system which must react upon the central nervous system, although their effect is not always expressed immediately, but more usually delayed. This repercussion of altered hormonal action is, however, very obvious in the tremor, tachycardia, altered oculo-cardiac reflex, and other sympathetic phenomena which persist for a long time after the original psychic trauma, and which become exaggerated on the slightest emotional disturbance. And the anatomical basis is not far to seek. From the experiments which have been conducted on animals we now know that fear produces in the blood a condition which is to all intents and purposes toxic. And Buscaino's<sup>4</sup> latest contribution to the subject takes us a step further. He has been able to demonstrate that definite histological reactions follow fear in the nervous, endocrinic, and other organs of an animal. For example, the urine of an animal suffering from fright contains sugar; the oxidising power of the blood is diminished; the affinity of all the nervous tissue for aniline dyes is reduced; there is increased activity of the nuclei of the nerve-cells, especially at the base of the brain; the neuroglia cells are richer in lipid material; the thyroid is increased in volume and the vessels congested; while a variety of changes occur in the liver, the cortical suprarenal, and the interstitial tissues of the testicle and ovary. With the physiological knowledge we now possess of hormonal action upon the central nervous system, it must be very obvious that if a morbid emotional condition can induce such changes in the endocrino-sympathetic system, then the hormones secreted must qualitatively and quantitatively change, and thus exercise grave effects through the blood-stream on the central nervous system, which tend not only to maintain, but aggravate, the original psychic disability.

The interdependence of the vegetative and central nervous systems and their reciprocal reaction are well exemplified by the clinical phenomena in cases of psychic trauma occurring during the recent war.

Pighini<sup>5</sup> gives an account of two cases of sudden death after psychic trauma which are of exceptional interest and illustrate the effect of strong emotional disturbance on the endocrino-sympathetic system. The first case on going "up the line" was



noticed to be emotional. After a bombardment lasting all night he developed diffuse tremor, tachycardia, mental confusion, and a certain degree of stupor. One month after admission to a neuro-psychic clinic signs of exophthalmic gôitre made their appearance. The thyroid gland was enlarged, there was pulsation in the neck, tachycardia, tremor, and general asthenia, marked dermatographism, hyperidrosis, and a high degree of emotional disturbance. While sitting quietly in the clinic one day he jumped up, became pale, and fell dead. The autopsy disclosed an interesting state of affairs. The brain and cord were normal to naked eye examination. The lymphatic glands in connection with the pharynx and intestinal tract were enlarged; there were lymphatic nodules in the thyroid; the thymus was persistent, covered with fat, and there was hyperplasia of both cortex and medulla. The heart was dilated while the muscular wall was flaccid and hypotrophic. The ascending aorta was narrow with thin walls, the spleen enlarged with hypertrophied Malpighian corpuscles, and in the suprarenals the medullary substance was soft and friable. Pighini diagnosed the condition as a thyreo-thymo-lymphatic state.

The second case was injured by a bomb and at once developed great emotion, tremor, nightmare, and marked disturbance of speech. Later on he developed swelling of the right leg on standing for some time. When seen by Pighini four months afterwards he presented pallor of the mucous membranes, cyanosis of the skin and dermatographism, hyperidrosis, enlarged thyroid, tremor of hands and closed eyelids, brisk knee-jerks, œdema, asthenia, and stammer. In this case also death occurred suddenly. The autopsy revealed an enlarged thyroid, narrow aorta, hyperplasia of lymph follicles, lymphatic follicles in the liver, spleen, and kidneys: all the signs of a thymo-lymphatic state. Pighini, in his commentary upon these two cases, draws attention to some important deductions. From their history he considers both cases were of the neuropathic diathesis and quite sane until subjected to psychic shock or strong emotion. He admits the difficulty of explaining the exact pathogenesis of the symptoms, but remarks that all the evidence in the present state of our knowledge points to endocrino-sympathetic disturbance. Disturbed action of the thyroid is quite common in this class of case, but it is noteworthy that the thymo-lymphatic system was involved also. The stammer points to involvement of the vagus nerve, which is the nerve of

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emotion *par excellence*. It is frequently involved in the early stages of psychic trauma, and the symptoms are usually those of hypotonia. The majority of cases exhibit tachycardia, or inversion of the oculo-cardiac reflex, though exceptionally in some one finds a temporary bradycardia and exaggeration of the above reflex. Pighini is of opinion that in all "psycho-traumatics" the vegetative system suffers, and that the clinical phenomena appear now in one part, now in another, according to the individual constitution or reactivity.

Both these cases illustrate very clearly the effect of psychic trauma on the thymo-lymphatic constitution: and from the hyperplastic thyroid and thymus, hormones chemically different from the normal must exert a deleterious, if not a toxic, effect upon the organism. The vagus nerve is very closely related to the thymo-lymphatic system. Experiments on animals have demonstrated that resection of the vagus is followed by acute yellow-atrophy of the thymus—especially of the cortex—by atrophy of the lymphatic follicles of the spleen, of the cortical substance of the suprarenal, of the interstitial substance of the ovaries and testicle, and by lymphatic leucopenia. Hence the internal secretion of those organs is in great measure regulated by the vagus.

Buscaino<sup>6</sup> has made some very interesting observations on a group of individuals (soldiers) who show profound disturbances of the vegetative system in ordinary life, which are, however, much more accentuated under emotional conditions, and frequently become associated with psychic disorders closely akin to certain clinical varieties of insanity. These individuals suffer from a constitutionally morbid kinæsthetic sense, that is of those collective sensations which go to make up the organic personality, and which are inseparable from the mechanism of the emotions.

An inquiry into the life history of these cases discloses many important points. They are "bad-tempered" and react too readily, are intolerant of discipline, of alcohol, and of high temperature; the conjunctival and pharyngeal reflexes are weak, the patellar reflex brisk, the visual field concentrically restricted, tremors are present, vague Rombergism, and red dermographism. The pulse-rate shows abnormal activity on the part of the vegetative system. Tachycardia is most frequently present; bradycardia is, however, not rare. The pulse variation in passing from the horizontal to the vertical

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position is most striking, while the oculo-cardiac reflex in 80 per cent. of the cases is either inverted, abolished, or weak, indicating sympatheticotonia.

There are many varieties of disturbed sensation, *e.g.*, the eyes feel heavy, the head full, slow prolonged "hammering" in the temples, paræsthesias, a feeling of constriction in the throat, "the right lung feels larger than the other," and precordial pain. Some patients complain of painful throbbing in the head accompanied by a feeling of rage.

These patients are highly emotional, passionate, and violent; they sometimes suffer from vague delusions of interpretation, impulsive tendencies, and phobias. Frequently, as a result of some painful emotional experience, the mental symptoms become accentuated, and a true insanity arises whose phenomena, in some instances, are hardly distinguishable from the so-called dementia precox. But there are two syndromes peculiar to those unstable individuals, a depressive-paranoid, and a schizophrenic condition. In the former there are delusions accompanied by psycho-sensorial errors. "Voices," are heard, people "accuse them of crimes," anxiety states are common. Apperception is hostile to the outside world and must of necessity prejudice every sensation. The disturbance of kinæsthesia, which the patient recognises as pre-existent for years before the onset of the mental trouble, assumes a new importance, and reinforces the deliriant ideas and the depressed psyche. In the above symptoms one can easily recognise a condition which bears a close similarity to the so-called dementia precox; although as Buscaino rightly points out there are certain distinctive differences which, however, are more of degree than of kind.

In patients presenting the symptoms of psychic dissociation or schizophrenia, as a result of unpleasant or painful emotions, ideation is apt to be restricted around a single episode. The individual is thus dissociated from the outside world, looks depressed, is anergic, suffers from stereotypy, repeating a single phrase over and over again. This verbal stereotypy is always connected with the original psychic trauma, and the associated injury to the endocrino-vegetative system is very obvious on investigation. For example, if in a case undergoing recovery the original psychic trauma be revived, then one finds that the pulse-rate at once rises. This psycho-spygmographic reaction supplemented by the oculo-cardiac reflex is valuable evidence



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of hyper-excitability of the sympathetic system; it is noteworthy, however, that in some cases the vagal system may be hypertonic, inducing an exaggeration of the oculo-cardiac reflex. All these symptoms point to an endocrinic intoxication and show that, in constitutional instability of the kinæsthetic sense, the vegetative system becomes very profoundly disturbed during a schizophrenic phase, and the phenomena are readily comprehensible when one remembers that the subjects of the symptoms are of the emotional type, and therefore are predisposed to disharmony of the endocrino-sympathetic system under the influence of emotional trauma. This disharmony of the endocrino-sympathetic system must inevitably result in an alteration of the chemical constitution of the hormones, or perhaps it might be safer at present to say an alteration in their correlative physiological balance, which repercusses upon the psyche of the patient, and tends to maintain the morbid frame of mind which has originated the whole train of events, and keep the entire mentality centred round the original theme, the original psychic trauma.

From all the above it is apparent that we must take a much broader view of the etiology and development of the psychoneuroses than we have done hitherto. We can no longer regard them as psychic disturbances in the narrow sense employed in the past, and must be prepared in future to attach less importance to the "psyche" and approach the problem much more from the physiological side, as the inter-reaction of the "psyche" and the endocrino-sympathetic system under emotion is so very obvious.

REFERENCES.—<sup>1</sup> Orr and Rows, *Brain*, vol. xli., p. 1. <sup>2</sup> Gaskell, *The Involuntary Nervous System*, London, 1916 (with full bibliography). <sup>3</sup> Quoted in Castellino and Pende's *Patologia del Simpatico*, Milan, 1915. <sup>4</sup> Buscaino, *Rivista di Patologia nerv. e ment.*, 9th Feb. 1920. <sup>5</sup> Pighini, *ibid.*, 27th Jan. 1919. <sup>6</sup> Buscaino, *ibid.*, vol. xxiii., p. 257.

## CRITICAL REVIEW

### THE CLINICAL PATHOLOGY OF SURGICAL SHOCK.

By JOHN FRASER, M.D., F.R.C.S., Surgeon to the Royal Hospital for Sick Children ; Assistant Surgeon, Edinburgh Royal Infirmary.

**Introduction.**—This contribution has been suggested by the fact that recent work has considerably modified our conception of the etiology and pathology of surgical shock.

The opportunity afforded by the recent war for the study of this condition was unique, and the work which was done during this period has forced us to reconsider, and in some cases entirely to remould, our ideas of the etiological pathology of the condition.

In this contribution an attempt has been made to co-relate and to summarise the more recently published work. Acknowledgment is made of the assistance which has been obtained from the published works of the Medical Research Committee (Shock Committee), of Professor Bayliss, University College, London, and of Professor Cannon, Professor of Physiology, Harvard University, U.S.A.

**The Earlier Experimental and Pathological Work.**—An account of the pathology of wound shock must necessarily include a consideration of the more important work which had previously been done in attempts at the elucidation of this most interesting problem.

It is an educating experience to read "A Summary of Shock" which was written by Mansell Moullin<sup>1</sup> in the *International Encyclopædia of Surgery* in 1882. One is struck by the fact that many of the theories which now rank as modern were suspected and even enunciated at that time.

G. H. Groeningen<sup>2</sup> in 1885 published *Ueber den Shock* (Wiesbaden), and in reading this volume one has a similar feeling that many of the so-called modern theories are comparatively old in their origin.

Perhaps one instance may illustrate this point. Keen in 1864 enunciated a theory very similar to that which Crile teaches at the present day, and H. Fischer<sup>3</sup> six years later carried out experimental work which appeared to confirm Keen's theory that shock was essentially a vasomotor phenomenon.

These details are now, however, of no more than historical interest.

**Recent Work.**—Previous to the subject being taken up by the special committee of the Medical Research Committee in 1916, opinion had definitely crystallised itself around certain theories; each of these put forward claims and propositions.

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Something may be learned from considering very briefly the more reasonable of these theories.

*Theories of Shock:—1. The Crile<sup>4</sup>-Mummery<sup>5</sup> Theory: Exhaustion of the Vasomotor Centre.*—The argument put forward was that sensory stimuli produced a rise of blood-pressure from the irritation of “pressor” nerves. The continuation of these afferent stimuli led eventually to exhaustion of the vasomotor centre and a subsequent fall of blood-pressure. It was further pointed out that in certain cases only a depressor afferent nerve existed, in the testis, for example, while in others the shock values varied, irritation of some inducing much more shock than irritation of others.

The criticisms directed at this theory came primarily from two sources—(a) The vessels in shock were said to be contracted and not dilated (Malcolm<sup>6</sup>—Seelig and Lyon<sup>7</sup>); (b) the vasomotor centre is not exhausted (Seelig and Lyon—Porter and Quinley<sup>8</sup>).

*2. The Henderson<sup>9</sup> Theory: The Acapnia Theory.*—The respiratory centre depends for its activity on the amount of CO<sub>2</sub> in the blood (Haldane and Priestley<sup>10</sup>). Excess of CO<sub>2</sub> produces stimulation of respiration; a diminution of CO<sub>2</sub> produces several deep respirations and a pause in the respiration called “apnœa.” According to Henderson, the deep and rapid breathing which is induced by painful stimuli reduces the CO<sub>2</sub> to a very low figure—acapnia—and this in his opinion is the primary cause of shock. He credited the fall of blood-pressure to a failure of the venous pressure, to the accumulation of blood in the venous spaces, and to impoverishment of the right auricle.

Henderson further attempted to show that when the abdomen is opened and the intestines exposed, there is relatively a great loss of CO<sub>2</sub> from the visceral surfaces, forty times as great as from the skin, and locally changes are gone through of vascular dilation, muscular paralysis, apnœa, and finally general shock. In later confirmation of his theory, Henderson quoted experiments by Sherrington and Copeman<sup>11</sup> which seemed to indicate that a diminution of CO<sub>2</sub> produces a great tendency for fluid to exude from the plasma into the tissues, leaving the blood concentrated. The sequence which Henderson claimed may be summarised as follows:—Hyperpnœa, acapnia, failure of the vasomotor pressor mechanism, venous anoxæmia, tissue asphyxia, acidosis, acute oligæmia.

Finally, it is interesting to observe the treatment of shock which Henderson recommended. He advised slow respiration, breathing through a long tube so that expired air loaded with CO<sub>2</sub> was re-breathed, pouring warm saline saturated with CO<sub>2</sub> into the abdominal cavity, transfusing warm saline saturated with CO<sub>2</sub>, allowing the subject to breathe in and out of a bag containing air or oxygen.

The Crile-Mummery and Henderson theories were the two which



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found most acceptance, but other view points were put forward by various observers, and we would mention these.

3. *The Boise*<sup>12</sup> *Theory*.—Boise recognised the importance of the fall in blood-pressure, and he ascribed this to a failure of the heart in systole. In support of his assertion, he quoted the very vague circumstance that in animals dying from shock the heart is contracted. This credit at least must be given, that Boise believed in his own contention because he suggested a practical line of treatment based upon it. He recommended the use of *veratrum viride*, which lessens systole and prolongs diastole. The fallacy of Boise's theory can easily be demonstrated: that the heart is not primarily weakened in shock is shown by the fact that when blood or gum solution is infused, the blood-pressure rises to its normal height.

4. *The Meltzer*<sup>13</sup> *Theory*.—This theory is based upon the recognition of a clinical fact, that when the abdomen is opened, or even when an extensive skin dissection is made, there is an inhibition of the peristaltic movements of the intestine. In a more severe injury, he believed that the functions of the spinal cord were inhibited, leading eventually to an inhibition of the medulla and its centres. It need only be said that there is no evidence that such a reflex inhibition of the spinal cord ever exists.

Other propositions put forward from time to time will only be mentioned, and anyone specially interested may consult the complete publications, reference to which is given:—

5. *Kinnaman's*<sup>14</sup> *Theory*. — Disturbances of the thermogenic functions.

6. *Jaboulay's*<sup>15</sup> *Theory*.—The formation of irreducible hæmoglobin.

7. *Vale*.<sup>16</sup>—The oligæmic theory.

8. *Bainbridge and Parkinson*.<sup>17</sup>—Loss of chromaffin tissue.

9. *Schur and Weisel*.<sup>18</sup>—Loss of chromaffin tissue after anæsthesia.

10. *Bissell*.<sup>19</sup>—Pulmonary fat embolism.

**The Clinical Picture in Shock.**—The clinical picture of established wound shock is one which in many respects is characteristic. The patient may be described as being in a state of prostration. He is roused from what appears to be a condition of mental indifference with difficulty, yet he answers questions clearly and intelligently if faintly. The face is drawn and pale, beads of perspiration stand out on the brow, the eyes are sunken, and the cheeks hollow. The lips and ears are pallid. The body surface is grey or dusky in appearance, being cold and clammy to the touch. The pulse is rapid and fluttering, and often all but imperceptible at the wrist. The respiration is irregular, shallow, and sighing, and the temperature of the expired air is abnormally low. The general body

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temperature is low. The mouth is parched and the patient complains of thirst. There is diminished sensibility to pain.

Such is the picture which is shown by a man in a fully established condition of wound or surgical shock, and of course the intensity of the features vary in different degrees.

Except in severe cases, there is a natural tendency towards recovery, and when this period is entered upon, it is spoken of as the stage of reaction. It is often ushered in by vomiting. The colour improves, the pulse becomes full and bounding, the respiration deepens and becomes more regular, the temperature rises, there is a noticeable improvement in his psychological condition, and the mental indifference of the early stage disappears.

Let us now discuss in greater detail the outstanding groups of clinical features which these cases present.

There are four of these groups which may be said to be primary—

I. Circulatory disturbances; II. Respiratory disturbances; III. Motor disturbances; IV. Sensory disturbances.

**I. Circulatory Disturbances.**—The clinical features which can be attributed to circulatory changes are the low arterial blood-pressure, the small thready pulse, the pallor of the body surface, and the low temperature of the skin. The first is the essential feature.

*The Low Arterial Blood-pressure.*—There are three active factors which maintain the blood-pressure at a normal level—the contracting heart, the bulbo-vasomotor mechanism which regulates the tonicity of the vessel walls, and the volume of the blood.

The enquirer naturally asks whether there is any evidence which would point to one or other of these being the factor responsible for the circulatory changes.

(a) *The Heart.*—Howell suggested that in shock there is a paralysis of the cardio-inhibitory centre, which results in an increasing rapidity of the heart beat and therefore in a weakening of its efforts. Howell's suggestion was contradicted by Mann's<sup>20</sup> experiments, for these showed that even in deep shock, stimulation of the central end of the cut vagus resulted in the characteristic reflex slowing of the heart. If further evidence on this point is required, it may be found in two other facts, namely, that an administration of adrenalin, from its effect upon the centre, causes dropped beats which could only occur when the centre is responsive, and that an increase of intra-cranial pressure, when it occurs in pronounced shock, stimulates the cardio-inhibitory centre and slows the heart. The evidence of these facts would appear to indicate that the nervous control of the heart is not interfered with.

What of the heart itself? To quote Mann's experimental work again, it would seem that as long as the heart is properly supplied

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with blood, there is an efficient contraction of the cardiac muscle. A persistent low blood-pressure of course incapacitates the heart (Markwalder and Starling<sup>21</sup>), but the essential point is that in surgical shock there is no primary error in its functional power.

(b) *The Bulbo-vasomotor Mechanism.*—It of course was a very natural assumption that the low arterial pressure so characteristic of surgical shock was due to a relaxation of the arterioles. This view was expressed many years ago by Mitchell, Keen, and Morehouse, and more recently this view was elaborated by Crile. The bulbo-vasomotor mechanism, being the centre which controls the arteriole tone, was said to be exhausted.

Without quoting any detailed evidence against such an assumption, for such evidence is now well accepted and recognised, it may be said that there is no appearance of paralysis of bulbar centres in the early stages of shock. Prolonged low blood-pressure by direct interference with nutrition leads to exhaustion of the centres, but such is purely a secondary result. In experimental shock the bulbo-vasomotor centres retain a nearly normal excitability for some time after the state of shock has developed. It is very likely that a temporary collapse of the centre occurs on incidence of the injury, but such is of the nature of a functional inhibition. The fact must not be lost sight of, that this primary inhibition may play a part in the production of later true shock, but the essential point is that there is no exhaustion of nerve centres (vasomotor) through a reflex origin.

Linked up with the question of exhaustion of the nerve centres is the possibility of arterial or venous paralysis, especially of the splanchnic vessels. This possibility would appear to be excluded by surgical evidence obtained at operation on cases of established shock.\* No appearance of distention of arterioles or veins in the splanchnic area was found in these cases. It may be asked, was there not the possibility of error that previous hæmorrhage had so emptied the vascular system as to prevent distention of the relaxed blood vessels? The answer is that the observers had this possibility in view, and the examinations were made in cases where the possibility of severe hæmorrhage could be excluded.

Now, if the vasomotor centre is not exhausted, the question arises as to what its actual condition is in shock. The evidence obtained in recent observations points towards an efficient contraction of peripheral and visceral arterioles. Indeed the skin pallor, so characteristic of shock, would seem to indicate a peripheral vaso-constriction. The sweating and the pupil dilation would indicate that the sympathetic nervous system too is active. The experimental evidence of the activity of the vasomotor mechanism is clearly established; it need not

\* Wallace, Fraser, and Drummond, *Lancet*, 1917, p. 727.



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be stated here: it will be found in the publications of Seelig and Lyon,<sup>22</sup> Guthrie,<sup>23</sup> Seelig and Joseph,<sup>24</sup> Morrison and Hooker.<sup>25</sup>

At this point it is well to draw attention to the work of Crile<sup>26</sup> and Dolley,<sup>27</sup> in which they recount histological evidences of exhaustion of nerve-cells in the central nervous system. The inference which these observers drew was open to criticism from several sources, and Professor Mott undertook an investigation of the central nervous system of a case of shock. He drew attention to the similarity in every respect of the changes which he found to those which he had experimentally produced by ligaturing all the arteries carrying blood to the brain. He regarded the whole of the nerve-cell changes as a secondary result of intense cerebral anæmia due to the prolonged low blood-pressure.

(c) *The Blood Volume*.—If the heart and its associated nervous mechanism is efficient, and the bulbo-vasomotor centres are unimpaired, it remains to be considered whether the fall in blood-pressure is due to an alteration in the blood volume. A diminution of the volume of blood in circulation would explain the low arterial pressure.

Henderson has pointed out the necessity for a sufficient supply of blood to the heart in order to maintain the arterial pressure at its normal level; in the absence of supply, *e.g.* in hæmorrhage, the arterial pressure falls to a low level and can only be permanently raised by introducing more fluid into the circulation.

There is evidence to show that in cases of established shock there is a diminution in the volume of blood in circulation. This evidence has been obtained by the use of the vital red method, and results of investigations have been published by Keith<sup>28</sup> and O. H. Robertson and A. V. Bock.<sup>29</sup>

It having been established that the blood volume in active circulation is reduced, and assuming that the loss cannot be accounted for by hæmorrhage, the question naturally arises as to where the blood goes when it passes out of active circulation. Cannon has put the question in an appropriate form when he talks of "the problem of the lost blood." Until recently the question was answered by the reply that the "lost" blood lay in the splanchnic area. It perhaps illustrates the danger of relying too much on pure experimental evidence when one realises that the experimentalist proved this point to almost general satisfaction, and yet, as we have already stated, clinical observation at operation failed to confirm the view. Those who are interested in the experimental aspect of the question will find it fully dealt with in the publications of Mann<sup>30</sup> and Morrison and Hooker.<sup>31</sup>

It must be acknowledged that the view that the splanchnic area is the "locale" of the lost blood strikes the observer as being a most feasible proposition, and though it appears to be contradicted by clinical

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observation, it is probably unwise to dismiss it entirely. It is quite possible that to some degree the splanchnic region may form a catchment area, and there are physiological reasons in favour of this. The portal circulation is almost unique in its arrangement. In it there may be said to exist two capillary regions—the capillaries of the stomach, intestines, pancreas, and spleen, and the capillaries of the liver. A considerable amount of work must be done to drive the blood through such a double system of fine blood-vessels, and from the aortic level of 120 mm. of Hg there is a fall to the portal level which is 10 to 12 mm., and a further drop in passing through the liver to zero pressure in the inferior vena cava. There is therefore a mechanical reason why there should be a tendency to stagnation of the blood in this area.

There is another reason, however, which must be quoted. Bayliss and Starling have brought forward evidence of the existence of a nervous government of the portal branches. Cavanzzani and Manca have also reported that induced asphyxia lessens the rate of flow of blood through the liver vessels, and this they believed they could explain by the increase of activity of the vasomotor centre in asphyxial conditions. Similar evidence has been brought forward by Schmid and Opitz, who used in their experiments electrical stimulation and the injection of adrenalin. If, then, there is vasomotor control over the hepatic vessels, and if there exists a vasomotor activity during the early stages of shock, it is possible that the resulting constriction may lead to an accumulation of blood in these vessels of the splanchnic area which lie behind the contracted vessels. Unfortunately, from the clinical standpoint it is impossible to confirm or deny such a possibility, and the only evidence we possess is that already quoted, which is rather against such an occurrence.

There is, however, another "locale" where the lost blood may collect, and recent work indicates that this is the main area of stagnation. The area referred to is the superficial capillary system, more especially of the body surface. In cases of shock, the red count of blood taken from superficial capillaries is considerably higher than that taken from the blood in active circulation (veins). The discrepancy is greater the more profound the shock, and not infrequently it is as much as 2,000,000 corpuscles per cubic millimetre. Since the venous count is approximately normal, the condition is due to a stagnation of corpuscles in the capillaries. The observations by means of blood counting have been confirmed by hæmatocrit and hæmoglobin determination. This condition once established in shock, is only gradually recovered from. The recovery sometimes requires two or three days (Cannon, Fraser, and Hooper<sup>32</sup>). It is impossible to estimate how much blood passes out of active circulation secondary to

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the peripheral stagnation and concentration, but it is not unreasonable to assume that this development may account for the reduction in blood volume to which we have already drawn attention.

*Summary of Circulatory Changes.*—Let us at this point briefly summarise what one may term the clinical pathology of the circulatory changes observed in shock.

1. There is a marked and progressive fall in arterial blood-pressure.
2. The heart and its nervous mechanism is not primarily involved or affected, but a persistent low blood-pressure will eventually interfere with its functional ability.
3. The bulbo-vasomotor centre shows no sign of paralysis in the early stages of shock. There may be a momentary depression at the period of injury, but this is purely inhibitory. There are indications that in the early stages the vasomotor centre may even be more active than normal. With the continuance of a low blood-pressure, the centre suffers from deprivation in common with other tissues.
4. There is a reduction of the blood volume in shock, and apart from cases of hæmorrhage, the reduction is probably to be explained by a stagnation and concentration of blood in the superficial capillaries.

**II. Respiratory Disturbances.**—Shock respiration is of the superficial rapid type, and it is very similar to that with which the clinician is acquainted in toxæmias and after severe hæmorrhage. The shock victim breathes rapidly. There are occasional deep sighs or gasps, and at intervals there is what we can only describe as a quick respiratory “flutter.”

Yandell Henderson in his “acapnia” theory claims that the respiratory change is the primary factor in shock, that painful stimuli give rise to such extremes of pulmonary ventilation as to diminish the  $\text{CO}_2$  contents of the blood and so to produce an acapnia, to which he ascribes the circulatory phenomena of a shocked case. There are certain objections to Henderson’s view. In shock the respiration is essentially shallow, and as Edsall has pointed out, in superficial respiration the gaseous exchange occurs more and more in the “dead spaces”—*e.g.*, trachea and bronchi—in so far as the respiration becomes less and less deep. Therefore it is reasonable to assume that the effect of shallow respiration will be to increase rather than to diminish the  $\text{CO}_2$  contents of the blood. The second objection to Henderson’s theory is a more potent one. If the “acapnia” view had been correct, the body in shock would show a diminished amount of  $\text{CO}_2$ , but as Janeway and Ewing<sup>33</sup> have demonstrated, the  $\text{CO}_2$  content of the body is not reduced, and this observation has been confirmed by Rendall Short in regard to the venous blood in shock.

If the respiratory changes are therefore not primary, some explana-



tion must be afforded in so far as they are secondary to some other change. There are possibly three factors which so affect the respiratory centre as to produce the effects we have described.

The blood-pressure associated with the shocked condition and the diminution in the amount of circulatory blood will reduce the  $O_2$ -carrying power of the blood. It is known that reduction of the oxygen carried by the blood to the central nervous system produces a hyper-irritability of the various nerve cells and centres, and this is undoubtedly one of the explanations of the rapid respiration of the shocked condition.

The second possible factor producing the characteristic respiratory change is one upon which opinion is not yet decided. It is the exaggerated Hering-Breuer reflex described by Haldane.<sup>34</sup> One word of explanation is necessary in regard to this reflex. As the lungs are being stretched by the action of the respiratory muscles, certain nerve endings or receptors are stimulated. When stimulation has reached a certain point, inspiration is inhibited and expiration is excited. Under certain abnormal conditions, inhibition occurs early in the course of inspiration and a rapid, shallow respiration therefore results. Wound shock, and hæmorrhage appear to constitute one of the abnormal conditions, but whether the effect which produces the irritability is exercised upon the "receptors" or upon the respiratory centre is undecided.

This leads naturally to the last factor which affects the respiratory centre. Owing to the ineffective nature of shallow breathing, there is an abnormally high carbon-dioxide content in the blood. At the same time, there is, for reasons which are discussed elsewhere, a reduction of the bicarbonate salts of the body. The result of these changes, the increase of  $CO_2$  in the blood and the reductions of the body alkali, is an increase in the hydrogen-ion of the blood.

Now Haldane and Priestley have shown how extraordinarily sensitive the respiratory centre is to a slight increase of the hydrogen-ion concentration, and the type of respiration which occurs is not of the rapid, shallow type, but of the rapid, deep character. It is in fact an effort of the body to get rid of the carbon dioxide by increased ventilation of the lungs. This type of respiration is sometimes seen in the terminal stages of shock, but it is probably more correct to say that when this type of respiration occurs, the condition has passed out of the domain of surgical shock and entered that of acidosis.

There is a final consideration which may have a bearing upon the respiratory changes in shock. Edsall points out that very rapid breathing may abolish entirely respiratory blood-pressure changes. It is possible that this is an important safeguard for the heart, because with a greatly reduced arterial pressure a further diminution, such

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as would occur with each deep respiration, might so lower the pressure as to diminish the flow through the coronary arteries and so impair the cardiac contraction.

*Summary of Respiratory Changes.*—1. The respiratory changes are not primary but secondary in character.

2. The factors which affect the respiratory centre are the low arterial pressure with its associated diminution in the  $O_2$ -carrying power of the blood, an exaggeration of the Hering-Breuer reflex, and in certain terminal cases, an increase of the hydrogen-ion content of the blood with direct stimulation of the respiratory centre.

3. The characteristic respiration in shock is of a rapid, shallow character. If an acidosis effect comes into play, the respiration becomes deep and rapid.

**III. Motor Disturbances.**—The characteristic motor disturbance of shock is an increasing motor weakness which eventually extends into what one may term a general muscular apathy. It has been suggested that the motor changes are the result of repeated sensory stimuli which, being converted in the central nervous system into motor impulses, eventually lead to a physiological block in the motor tracts. Sherrington has disproved this possibility. He has shown that if stimuli be repeated so as to produce a block in the afferent paths, and therefore a failure in the reflex, the reflex is at once produced if a new afferent path be chosen. Therefore, the motor mechanism is less affected than the sensory in repeated stimulation.

The explanation of the motor changes is to be found in the low arterial pressure. Gruber has proved that when the systolic pressure is reduced below 90 mm., the muscles as contractive organs become less capable of work. The whole central nervous system shares in an impaired nutrition secondary to the lowered blood-pressure; the afferent tracts and sensory cells, the synapse, motor cells and tracts are equally affected. It is therefore not surprising that in the victim of shock there is a general relaxation of the body musculature, irregular and feeble movements, and a slowing and weakening of central nervous functions.

These remarks are intended to apply more especially to striped or voluntary muscle. Involuntary or non-striped muscle, e.g. the alimentary canal, is also inhibited, but its inhibition has a different explanation from that of voluntary muscle. In the case of the non-striped muscle, the inhibition would appear to be due to activity of the sympathetic nervous system.

**IV. Sensory Disturbances.**—One of the most striking evidences of shock is a diminished sensibility to stimulation. The blunting of

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sensation and the general apathy are features which have been emphasised in all the clinical accounts of the shocked state. The physiologist has long recognised this. One of the methods of inducing shock in the animal consists of exposing and manipulating the intestine. As the condition of shock gradually develops, the animal becomes progressively less responsive to stimuli, restlessness disappears, and there is a distinct reduction of sensitiveness of the entire body. This is a close parallel to the features which are distinctive of shock in the human subject, and therefore it is of interest to know how the physiologist explains the features which he has observed experimentally.

Sherrington's explanation is that the ingoing impulses are blocked at the junction or synapse between the afferent nerve cells or neurones and neurones lying wholly within the central nervous system. The phenomenon of "blocking" he accounts for as due to an increase of the natural resistance at the synapse to such a degree that the impulses fail to pass. By this means the body as a whole would be protected against the effects of repeated stimulation along a given course.

Further information may be demanded as to why there should be such increased synaptic resistance in shock. The injury accounts for the afferent stimuli, but as Porter's experiments have shown, another feature comes into play, namely, low arterial pressure. Porter studied the effect of low blood-pressure on the minimal strength of a stimulus required to evoke a reflex in the spinal cord. He found that with a uniform elevation of arterial pressure the threshold stimulus for the reflex remained practically uniform. If the blood-pressure is lowered, the threshold rises, the synaptic resistance increases, and an increasing strength of stimulus is required to call forth a reflex.

In Porter's experiments, the minimal stimulus rose from 40 units to 110, solely as a result of the lowered arterial tension. The lowered arterial tension may, of course, be read as a diminished amount of oxygen or an increase of carbon dioxide; both of these conditions have the effect of raising the synaptic threshold.

The evidence indicates, therefore, that the sensory disturbances which appear in shock are the result of an increased synaptic resistance, this being due in part to an excessive stimulation along afferent tracts, and partly to a continued low blood-pressure.

**The Morbid Anatomy of Shock.**—In the preceding pages we have attempted to outline what we have termed the clinical pathology of shock; we have described the changes from normal as they appear on clinical investigation.

The consideration now arises as to whether there is any morbid anatomy peculiar to shock. The answer to this question is that



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examination of the body after death has revealed little of importance. It must be borne in mind that the majority of cases of shock are complicated by two other conditions, namely, hæmorrhage and the absorption of toxic or septic products. These complicating features may produce morbid changes, and from time to time errors have occurred from ascribing such changes to shock. This possibility of error is well illustrated in regard to the changes which were said to occur in the central nervous system (chromatolysis, etc.), and we have described how these changes are the result of an anæmia (Mott).

It must be confessed that with our present methods of investigation no morbid changes can be demonstrated other than those we have described under the heading of Clinical Pathology.

**Other Pathological Considerations.**—In the description of the clinical pathology, we have shown that underlying the majority of the clinical changes there is a basis of arterial hypotension. In addition, there are a number of other pathological details which investigations have brought out, and it is necessary at this stage to refer briefly to them.

1. *Capillary Stasis and Increased Permeability of the Vessel Walls.*—Sherrington and Monkton<sup>35</sup> in 1893 reported a concentration of the blood in shock, and they ascribed this to an increased permeability of the vessel walls with an escape of plasma into the tissues.

In 1916 Marshall found that the hæmoglobin percentage of the blood was increased in cases of shock.

Cannon, Fraser, and Hooper confirmed this in 1917, and they showed that the red count taken from various capillaries is higher than that of blood taken from a vein. The discrepancy is greater the more profound the shock, and not infrequently it is as much as 2,000,000 corpuscles per cubic millimetre.

The importance of these observations hangs upon the fact that during the progress of a case of shock there is an increasing tendency to concentration of the blood in the superficial capillaries.

The question of an increased permeability of the vessel walls is probably a natural result of the arterial hypotension. It has a practical application in so far that saline fluid introduced into the vessels while they are in this condition passes through the vessel walls with great ease.

It has been suggested that coincident with the arterial hypotension and the capillary concentration there is a roughening of the endothelium lining the vessel walls. This suggestion has not been confirmed by histological studies.

2. *The Absorption of Toxic Products from Infected or Damaged Tissues.*—Sir Cuthbert Wallace has emphasised the increased liability

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to shock when large muscular masses were cut. He cites as an example the fact that in amputation of the lower limbs, shock increases as the body is approached, and he contrasted the degree of shock in inter-scapular thoracic amputation and amputation at the hip-joint. The degree of shock is infinitely greater in the latter, though the wound areas are very similar in extent. The greater degree of shock is due to the amount of muscular tissue which was cut through.

The experience of the late war confirmed this view in many respects, and it has been repeatedly noticed that cases of compound fracture of the thigh and multiple wounds were peculiarly liable to shock.

Such observations as these were made the basis of an experimental investigation carried out by Bayliss<sup>86</sup> and Cannon. They found that within an hour after producing a compound fracture of the femur in an anæsthetised cat, the fracture being accompanied by bruising of the large flexor muscles of the thigh, the animal showed signs similar to those which one associates with secondary wound shock. The blood-pressure gradually fell, pulse rate and respiration increased, the blood showed signs of concentration, and the animal finally succumbed.

The next step in the experiment was to isolate the limb from the central nervous system, and subsequently to traumatise it in the way described. The sequel was exactly similar, and this result definitely excluded the possibility that harmful afferent stimuli from the injured limb was responsible for the symptoms.

When, however, the third stage of this experiment was carried out, and the return of blood from the damaged limb was prevented by means of small clips, there was no resulting fall of blood-pressure. As soon as the clips were removed and the returning blood reached the body, the blood-pressure fell.

It may be said that the chain of evidence was complete, and that the muscle destruction resulted in the liberation of a tissue poison which, circulating in the blood, produced the deleterious signs we have noted.

From this point, the question naturally arises as to how the tissue poison acts in producing the changes we have described. Vincent and Sheen<sup>37</sup> in 1903 found that extracts of muscle have a specific effect in producing vaso-dilation. Dale and Richards<sup>38</sup> in 1918 showed that histamine dilates the capillaries, and they suggested that substances of similar action are produced by injury to tissues. The result of a widespread capillary dilation would be the "side tracking" of a considerable amount of blood into them, and the loss of this amount of blood to the general circulation would act very similarly to a hæmorrhage. This basis, therefore, affords a reasonable explanation of the serious symptoms which follow the destruction of large areas of tissue.

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Dale and Laidlaw<sup>39</sup> observed that after large doses of histamine, a condition developed which could only be described as one of shock, and it may be accepted that extensive destruction of body-tissue by such injuries as shell wounds play an important part in the production of wound shock through the medium which we have described.

3. *The Effect of Body Temperature on Shock.*—It is difficult to over-estimate the importance of cold as a factor in wound shock. It is possible that it acts as one of the factors which originates the condition; it is certain that it has a powerful exaggerating effect when shock has become established. The cooling of the body surface results in a retarding of the blood flow through the superficial capillaries, and this directly leads to a lessened supply of heat to other regions of the body. The cooling also probably increases the viscosity of the blood, and thereby the blood flow in the capillaries is still further retarded. An aggravating factor in the progressive fall of blood-pressure then comes into play, and as the blood-pressure falls, the actual production of body heat is probably lessened.

In a series of wounded presenting low blood-pressures, the temperature taken of the interior of the thigh muscles was found to be as far below the normal as 94° F. and even occasionally lower.

The effect of cold may be summarised as follows: The cooling of a person in shock is attended by a further lowering of an already low blood-pressure, or by continuance of the pressure at a low level.

4. *The Possible Hypersecretion of Adrenalin.*—The theory was at one time advanced that exhaustion of the suprarenal bodies played an important part in the production of shock. It was suggested that the strong physical influence which affected soldiers in action produced this deficiency, and the sustaining of a wound by men in such a condition was, so to speak, the lever which set a-going the cycle of shock symptoms, the symptoms being really due to the suprarenal insufficiency.

Investigation has shown that instead of suprarenal exhaustion being present, the reverse is the case. From the work of Cannon<sup>40</sup> and Elliott<sup>41</sup> it is practically certain that wounded men "show the presence of adrenalin in the blood," and these observations were confirmed by Bedford in experimental shock.

Experimentally also, the injection of large doses of adrenalin produces a shock-like condition in the animal (Bainbridge and Trevan<sup>42</sup>).

It is possible, therefore, that an increased activity of the suprarenals may play some part in the complexity of features which go to produce wound shock, but it must be added that this rôle is of a minor and secondary nature.

5. *Deficient Oxygenation of Body Tissues in Shock.*—Of all the



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various manifestations of shock, a diminished blood-pressure is undoubtedly the most outstanding feature. A direct result of such a continued low pressure necessarily implies a diminished oxygen supply to the various body tissues. The deleterious effects of this insufficiency of oxygen is manifest in shock, and we have already described how the cytolysis of central nervous system cells was at one time assumed to be a primary factor in shock. Mott showed that these changes, in common with those in other tissues, were secondary to an anæmia and deficient oxygenation.

A further interest in this connection, and one of great importance from the practical point of view, is the varying degree of resistance which different tissues show to diminished oxygenation. It is a fortunate provision that the vasomotor and respiratory centres of the central nervous system display considerable resistance. We have no exact information on the point, but it would seem that in man the respiratory centre may fail before the vasomotor centre.\*

The practical importance of these observations is the encouragement which it gives to efficient resuscitation treatment. The body tissues have a definite limit of endurance to the effects of sub-oxygenation, and this limit may be expressed in terms of the blood-pressure. Clinical experience has shown that after the systolic pressure has remained at 60 to 70 mm. for from four to six hours, the patient cannot as a rule be resuscitated even by blood transfusion. Though expressed in terms of millimetres of blood-pressure, it really means that under such conditions the tissue cells have suffered too long from lack of oxygen and that the process of tissue death has advanced too far to permit of recovery.

There is a further practical bearing, that any method of treating shock which tends to aggravate the sub-oxygenation of the tissues is necessarily harmful. This is the objection to the use of massive doses of morphia, for the drug by depressing the respiration increases the cyanosis and therefore diminishes the oxygen supply to the tissues.

6. *The Relationship of Acidosis to Wound Shock.*—For some time previous to the more recent investigations, physiologists had suspected that an increase of the  $\text{CO}_2$  content of the blood played a part in the development of shock. Hooker<sup>43</sup> had observed that  $\text{CO}_2$  in minimal effective amounts caused relaxation of muscle, while  $\text{O}_2$  was essential to the maintenance of muscle tone. At this time it was accepted as the basis of shock origin that the blood collected in the splanchnic area; and Cannon in the Shattock Lecture of 1917 advanced the argument that an excess of  $\text{CO}_2$  in the blood accumulated in this area and exercised the effect which Hooker had demonstrated, and produced relaxation of the vessel walls, with aggravation of the stagnation.

\* Pike, Guthrie, and Stewart, *Journ. of Expt. Med.*, 1908, 10, 499.

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We have described how the "splanchnic" theory became discredited, but a great deal of interest continued to circulate round the possibility of the general effects of diminution of the blood alkali in shock.

It is essential at this point to give some detail regarding the theoretical basis of the question of blood alkali and "acidosis."

Normal blood plasma contains a certain percentage of sodium bicarbonate; it constitutes the "alkali reserve" of the blood and one of the alkali reserves of the body. A reduction of this alkali reserve, or sodium bicarbonate, is spoken of as "acidosis" (L. J. Henderson,<sup>44</sup> 1909, and van Slyke,<sup>45</sup> 1917). It is necessary, however, to draw a distinction between acidosis in the sense of Henderson and van Slyke, a mere reduction in the alkali reserve of the blood and a change in reaction, an increase of the hydrogen-ion concentration or acidity of the blood and the tissues.

The bicarbonate of the plasma always contains a weak acid in the form of dissolved  $\text{CO}_2$ , and the H-ion concentration of the plasma is determined by the ratio between the  $\text{H}_2\text{CO}_3$  (dissolved  $\text{CO}_2$ ) and  $\text{NaHCO}_3$ . When the bicarbonate decreases while the  $\text{CO}_2$  increases or remains constant, the H-ion concentration rises. If the  $\text{CO}_2$  decreases while the  $\text{NaHCO}_3$  remains constant or increases, the H-ion concentration falls. If both vary together so that their proportion to one another remains constant, the H-ion concentration is unchanged. To put the matter simply, but less correctly, the acidity of the blood is due to the carbon dioxide, the alkalinity to the bicarbonate.

In early publications on shock (Y. Henderson,<sup>46</sup> 1910), the occurrence of acidosis as a secondary development was mentioned, and in more recent publications (Crile,<sup>47</sup> 1915, Morriss,<sup>48</sup> 1917, Caldwell and Cleveland,<sup>49</sup> 1917, Austin and Jonas,<sup>50</sup> 1917), acidosis was noted as a result of operation under anaesthesia.

Wright,<sup>51</sup> in his study of the toxæmia of gas gangrene, observed a reduction of the alkalinity of the blood serum as determined by titration with acid to a certain end point, and he definitely recognised the "acidæmia" as the cause of the shock-like symptoms of the patient suffering from this form of toxæmia.

Shortly after this, Cannon<sup>52</sup> began an investigation at a Casualty Clearing Station in France, and using van Slyke's method for measuring the alkali reserve of the plasma (plasma bicarbonate), he reported a notable deficiency of the alkali reserve in the blood of patients suffering from shock. His observations showed that the extent of the deficiency generally corresponded with the severity of the shock, and he recommended that the amount of the reduction of the alkali might be used as an index as to the fitness of the patient for operation.

The question now arose as to whether the acidosis, the existence of which in shock was beyond dispute, should be regarded as a

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determinant factor in the cycle of shock symptoms, an essential cause in other words, or whether it was merely a secondary result of a progressive circulatory deficiency. This important question has now been decided, and it is fully discussed in Report No. 7 of the Shock Committee. The results arrived at may be summarised as follows:—

(1) Acidosis in the sense of a simple reduction of the bicarbonate of the blood plasma is not the cause of shock or an important factor in its production.

(2) Experimentally in dogs it has been found that the pressure could be kept at 80 mm. for an hour without a reduction of the alkali reserve. Below 60 mm., however, a reduction always occurred. After a 20 per cent. hæmorrhage, a pressure of 80 mm. for an hour reduced the alkali reserve—*i.e.*, produces acidosis.

(3) A progressive uncompensated fall of the alkali reserve is the result of an inadequate oxygen supply to the tissues.

(4) Oxidation of the tissues is more easily rendered inadequate by defective circulation through the capillaries than by a reduction of the oxygen-carrying power of the blood, or of oxygen tension in the inspired air when the circulation is kept at an efficient level.

(5) The progressive uncompensated fall of the alkali reserve is a symptom of a deficient capillary circulation and not a cause of such.

(6) To some extent the rise of H-ion concentration (fall of the alkali reserve) must be regarded as a protective measure rather than harmful, except in the terminal stage.

(7) The protective action comes into play through the stimulating effect on the bulbar centres, though it must be confessed that the protection has little value, for the depressed centres are incapable of a normal response.

**Three Collateral Factors in Shock.**—We have discussed the clinical pathology of shock, and we have described certain secondary pathological points. There still remain three other factors, and these we have termed collateral factors. They are: cold, hæmorrhage, and sepsis. These three, collectively or individually, exert their influence in practically every case of shock. They act in a variety of ways. Cold is probably an important factor in effecting a delay in the capillary circulation, and when long continued it depresses all the body functions. Hæmorrhage rapidly leads to a fall in blood-pressure and all its associated deficiencies. Sepsis produces a fall in blood-pressure, and by the circulation of toxins, harmful effects are exercised on the body as a whole.

**General Conclusions as to the Nature of Surgical Shock.**—The essential underlying factor in the pathology of shock is a prolonged and progressive fall in blood-pressure.



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The causes which may inaugurate the fall of blood-pressure are various, some are nervous, some clinical. Hæmorrhage and the absorption of toxic products from injured tissues are powerful collateral and sustaining factors in the production of shock.

With the establishment of a low blood-pressure, something of the nature of a vicious circle comes into play. The prolonged hypotension leads to sub-oxygenation of the body tissues and a capillary stasis. The capillary stasis reduces the amount of circulating fluid, and the sub-oxygenation of the tissues results in the appearance of various toxic products from imperfect tissue metabolism. All of these collectively further reduce the blood-pressure, and so the vicious circle goes on. It will continue to a fatal issue until some link in the chain is broken and the error of the blood-pressure is overcome.

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## NEW BOOKS

*Treatment of the Neuroses.* By ERNEST JONES, M.D. (Lond.)  
M.R.C.P. (Lond.). Pp. viii. + 233. London: Baillière,  
Tindall & Cox. 1920. Price 10s. 6d. net.

There is much to be commended in this book. Dr Jones has made a fairly complete survey of the modern methods of treatment, and though he is an upholder of Freud's views in their entirety, he does not totally deny virtue in methods which do not depend on Freud's doctrines. The author is not, however, quite fair towards Déjirine's methods, which other psycho-therapists have found extremely helpful and illuminating, and which he himself does not appear to have practised.

A certain note of pessimism pervades the book. The cure of the psycho-neuroses by analysis does not seem the certain thing it appeared to be a few years ago. The author states that it would be better to reserve psycho-analysis for the early and mild cases, while the severe and advanced ones should be treated by palliative methods, as at best they can hope for relief only rather than cure. If this be true the whole value of Freudian analysis as a therapeutic agent seems to be in question. Not only do all psycho-therapists of any school claim to be able to cure these milder cases, but also it does not seem likely that patients of this class will consent to prolonged analysis. For most, the remedy would be worse than the disease; and this may be stated with confidence despite of the present craze among a number of eccentrics to have themselves analysed even though they are not on the sick list.

The classification of the neuroses is according to Freud, but it cannot be said that it is a good one. The author seems to be aware of this when he says that one class shades into another. It is a pity that one of Dr Jones's ability and insight cannot throw Vienna over in any respect. He knows that the different forms in which the neuroses appear are not really entities but only different ways of reaching to the difficulties of life, and that nothing is gained either in description of phenomena or in treatment by making subtle distinctions between "anxiety hysteria" and "anxiety neurosis." In every case the patient is reacting uncomfortably to a difficulty, and the problem is to find out why he is doing so. There are in truth nearly as many forms of reaction as there are patients.

The book does not provide detailed technique; but as a general review of the subject it is worth reading. One of its weakest points is the treatment of symptoms. The sentence, "Sleeplessness is often a troublesome symptom, and it is important to exhaust all



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other measures, such as hot baths, wet packs, etc., before resorting to hypnotic drugs," speaks for itself. The author seems to have no knowledge whatever of the ease with which sleep may be obtained in most cases by simple explanation.

*Traumatismes Cranio-Cérébraux.* By H. DURET. Pp. xxx. + 1502, with 320 illustrations. Paris: Felix Alcan, 1919.

For nearly forty years Professor Duret has devoted his attention to the investigation of the mechanism of cranial injuries and the physio-pathology of cerebral lesions. This monumental work is an instalment of his conclusions on the matter, based on his own experimental researches and clinical experience, as well as on the published work of other observers. The present volume deals with the mechanism and etiology of fractures of the skull—vault and base, and the localising symptoms. It is not a book that lends itself to detailed description; suffice it to say that as a work of reference it is unique, and should be in every consulting library.

## ANALYTICAL NOTE

CADBURY'S PREPARATIONS (Messrs CADBURY BROS. LTD.)

THE food value of the products of the cocoa bean, in the form of cocoa as a beverage, or of chocolate as a confection, are so widely recognised, and the use of these is now so general, that it is of the first importance to ensure that the preparations given to children and invalids are free from foreign ingredients and other impurities. In certain brands, although described as "pure" cocoa, the shell of the bean is present in considerable quantity, the proportion sometimes in the past being as high as 18 per cent.

We are able to furnish analyses of the various products of the Bournville factory of Messrs Cadbury, which show that they meet all the requirements of a nourishing and easily digested food for invalids.

The *Cocoa Essence* and *Bournville Cocoa* contain fat, 27 per cent.; albuminoids, 23 per cent.; and carbohydrates in the form of cocoa starch, gum and digestible cellulose, 32 per cent.—making a total of easily digestible material of 82 per cent. One ounce of such a cocoa will yield 135 calories.

These preparations contain no sugar or foreign starch, and they are prepared from "shell-free" beans, from which some of the excess of cocoa butter has been expressed.

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# Edinburgh Medical Journal

*November 1920*

## STUMPS AFTER AMPUTATION IN RELATION TO ARTIFICIAL LIMBS.

By CHARLES W. CATHCART, F.R.C.S.

THERE are many departments of surgical practice in which valuable lessons applicable to peace time can be learned from the experience of war. One of these is amputation looked at from the point of view of the artificial limb which is to be fitted to the resulting stump. It is true that this aspect of the amputation question has not been hitherto overlooked by surgical writers, but with improved methods of surgical practice and of artificial limb construction revision of old standing rules becomes from time to time necessary. As the result of the Great War about 40,000 men in Great Britain and Ireland alone have lost one or more limbs. Of these men about 1176 have been supplied with artificial legs, and 405 with artificial arms at the Edenhall Hostel for Limbless Sailors and Soldiers domiciled in the East of Scotland. As surgeon to the Hostel since it was opened in 1915, I have had the opportunity of seeing nearly all of these men supplied with their first limbs and, what is perhaps more important, of seeing a large number of them return for the supply of second limbs after they had tested the first limb by months or years of hard work.

More than thirty years ago I tried to work out some of the general principles which underlie the relation of stumps to artificial limbs,<sup>1</sup> and have found these principles useful in the greatly extended experience which has fallen to my lot from the war. In re-stating these principles I have a little to add and not much to change.

At the outset it seems desirable to draw attention to some premises which, although apparently self-evident, are frequently ignored. Thus the functional demand made upon any stump to which an artificial limb is fitted is similar to the functional

demand formerly made on the normal limb. Hence, while certain demands are made in common on the stumps of both upper and lower extremities, other demands are made specially on the stumps of one or other. Thus every stump must be long enough to enable it to be effectively grasped by the bucket of the artificial limb which it is to move; the joint or joints which a stump retains should, if possible, have full range of normal movement, and the muscles acting on the stump should not only retain their full power but should have, if possible, more than normal power to compensate for the leverage lost by shortening of the bone. Moreover, as the socket of the artificial limb has to be moved in different directions by pressure from the stump, the latter should have no tender point or points which will be hurt by such pressure. Length of stump is important both as affording greater leverage and as ensuring a larger number of muscular insertions. There are, however, one or two minor exceptions to this latter rule which will be mentioned later.

In the *lower limb* with which I propose at first to deal, the duties of the stump, when aided by the artificial addition to it, are similar to those of the original limb in walking. Thus, in the active phase of the step, the stump must help to support the body, balance it, and propel it forwards; while in the passive phase, it must help to swing the artificial limb forward for the next step. When possible the weight should be borne on the end of the stump, because the taking of weight at any point higher up, except at the tuber-ischii, involves more or less constriction of the limb, and this to some extent hampers movement and often causes discomfort. So far as the bone is concerned a section through the compact tissue of the shaft practically precludes end-bearing. On the other hand, when the broader portions of bone with cancellous structure form the bony end of a stump, more or less of the body weight can be borne on the end of the stump, provided that there be a good covering of muscle and especially of skin. Of this last the best illustration is the familiar one of Syme's amputation at the ankle.

In considering the question of length of stump in the thigh, it is well to remember that the abductors are concentrated at the upper end while the adductors extend all the way down the shaft to the adductor tubercle. Hence the power of balancing the body on a thigh stump becomes increasingly more difficult as the stump diminishes in length, until a point is reached when the stump is too short to be grasped by the bucket.



## Stumps in Relation to Artificial Limbs

Beyond this level, which will be discussed later, a short piece of the upper end of the femur ceases to be important from the point of view of an artificial limb. At the upper ends of the bones of the leg, however, the case is different. Even although a stump there may be too short to be fitted with a bucket, it should be left, for reasons which will be explained later.

Passing now to consider sites for amputation in the different regions of the lower limb we may begin with the foot.

*Loss of Toes.*—A considerable number of men have lost all their toes from frost-bite. For these cases a fairly stiff sole with padding in the toe of the boot has proved satisfactory in cases where the scar has not been too thin and tender.

*Hey's or Lisfranc's Amputation* at the tarso-metatarsal level has not come under my notice as the result of the war. I feel sure, however, from previous observation of this amputation, and from what I know of Chopart's, that a padded boot would give satisfactory results so long as the end of the bones were covered with a sound plantar flap.

*Chopart's Amputation.*—This operation has been condemned by many surgeons both in former years and recently, but in my opinion without good cause as I shall try to show.

In an Official Memorandum<sup>2</sup> issued under War Office authority in March 1916, the following statement is made on p. 6:—

"We are of opinion that whenever Syme's amputation is feasible, no other amputation (excepting removal of toes) should be performed in the region of the foot. . . . In Chopart's amputation the posterior part of the foot is useless. Sooner or later the heel becomes drawn up by contraction of the tendo Achillis, the terminal scar is directed downwards, and walking becomes impossible."

In July 1918 another edition of this memorandum appeared,<sup>3</sup> and although in it the earlier opposition to Chopart's amputation was somewhat modified, the real merit of the operation was not recognised, nor was the way to ensure success pointed out; it reads:—

"Chopart's amputation gives a broad walking surface, but contraction of the tendo Achillis may raise the heel and make the scar become the lowest part of the foot. Unless the stump is well covered it tends to ulcerate" (p. 12).

A similar attitude is adopted in a recent paper<sup>4</sup> by Irwin who says:—

"The amputations of Chopart and Lisfranc had their place in the days before anæsthetics and antiseptics; when rapidity of operating, and joint surfaces rather than sawn bone were important desiderata; but as definitive operations they should not now be performed."

Against these adverse views to Chopart's amputation we have to set the observations of well-known surgeons who have recorded successful results with it, and of patients who have expressed their satisfaction in using it for walking.

In describing his own "amputation at the ankle joint" in 1843,<sup>5</sup> Mr Syme advocated Chopart's amputation, except in cases where the extent of tuberculous disease made the removal of the whole foot necessary. It was for such only that he considered his own operation preferable to Chopart's, as he clearly states in the following quotation:—

"In proceeding to consider the circumstances in which this operation" (his own) "may be performed, it seems worthy of notice that, until a recent period, amputation of the leg was in this country generally resorted to for the removal of diseased bone, when the part affected extended upwards beyond the metatarsus. The operation of Chopart might frequently have accomplished all that was requisite, but unfortunately suffered from a prejudice which opposed its adoption. This was that the extensors of the heel, being deprived of antagonising action, would point the stump downwards, so as to render it useless as a support for the body. In 1829, for reasons stated elsewhere" (*Edin. Med. Journ.*, October 1829), "though there was no precedent for its performance in Edinburgh, I ventured upon this partial amputation of the foot with perfect success and without the slightest inconvenience of the kind anticipated. Encouraged by this result, I resolved to adopt the operation; and before long performed it six times with entire satisfaction. Since that time the operation has been established here and regularly practised in cases admitting of its application.

"Although the introduction of Chopart's operation considerably abridged the field for amputating the leg, there were still two situations in which caries frequently occurs where it was beyond the reach of any partial removal of the foot. These were the joint between the astragalus and os calcis, and the ankle joint itself." . . . (He then passes on to explain how he came to devise the operation now known by his name).

Other well-known British surgeons have held a similarly favourable opinion of Chopart's amputation. I now refer to two of them.

# Stumps in Relation to Artificial Limbs

Thus Erichsen,<sup>6</sup> referring to Chopart's amputation, says :—

"The result of this operation is extremely favourable, the patient, by aid of a properly constructed boot, being able to walk, and even dance, with very little appearance of lameness."

The late Sir William Banks of Liverpool<sup>7</sup> advocated Chopart's amputation accompanied by division of the tendo Achillis. Writing in 1884 he said :—

"Some three years ago I performed Chopart's amputation upon a young gentleman for a gunshot wound of the foot. The tendo Achillis was divided, and the fore-part of the foot kept well up during the healing process. So good a stump resulted that he is now an excellent cricket player, and recently won a prize at a long swimming match."

In 1887 I recorded several successful cases of Chopart's amputation and one of Lisfranc's<sup>1</sup>; some from personal observation, others taken from literature. In all of these cases a padded boot was the only appliance used, although in one or two cases the sole was strengthened with a steel plate.

As the result of wounds received in the Great War I have seen several cases of Chopart's amputation which have been quite as successful as these just referred to.

The following letter is from one of these men :—

2 ESSLEMONT AVENUE, ABERDEEN,  
1/3/20.

DEAR SIR,—Reference your letter, I wish to say that so far my amputation (Chopart's) has behaved splendidly and that I am up to the present able to walk about quite well with my boot padded as I have it now. At the same time I should wish to have the appliance that has been made by Mr Greenslade, as it may be better than what I have got now, but I am in no hurry for it, and with your approval I should like to wait a while yet before coming to Edinburgh to have it fitted as I should very much like to give this stump a bit more of a trial than what it has had up to the present.—I am,  
Yours truly,

Sergeant H. GRAY.

As he has made no further application up to date (August 1920), his case may be taken as confirming the experience of others previously recorded. That of a satisfactory result may be expected with a padded boot when there is a good Chopart stump. Another wounded soldier who was originally supplied with a standard appliance for Chopart's amputation, weighing



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4½ lbs., has latterly been wearing the simpler appliance introduced by Mr Greenslade which weighs three-quarters of a pound.

This man writes :—

16 CATHERINE STREET, ABERDEEN,  
16/10/20.

In answer to your letter I have given the artificial limb a fair trial and I find it far more suitable than the former one which was much heavier. . . .

Ex-Private WM. MUTCH.

The appliance made by Mr Greenslade to which Gray and Mutch refer consists of a leather anklet and sole piece to which is attached a wooden substitute for the missing fore-part of the foot. This appliance when fastened round the man's ankle fits inside his boot. In some cases the anklet is omitted. This type of appliance it will be seen is merely a modification of the padding in the fore-part of the boot to which reference has already been made. It was worked out to meet the requirements of a man in civil life who had had a Chopart's amputation for many years, and who had tried all sorts of appliances simple and complicated.

He writes :—

30/8/20.

I have benefited greatly since using this artificial foot, as it has brought the heel of foot back to its natural position. . . . I have plenty of walking at my daily occupation, and some distance to go and come from same; can take a turn after all this, and feel no bad effects. . . .

WM. M'ROBBIE, Senr.

This artificial foot (or part of foot) is lighter, cheaper, and much more comfortable than the standard Chopart appliance. It can be worn with an ordinary boot.

During the war, however, I saw also several unsuccessful cases of Chopart's amputation for which re-amputation was necessary. In most cases failure was due to cicatrices covering the ends of the bones instead of the prescribed plantar flap. Sometimes it was due to pointing of the stump from drawing up of the heel, associated with scar tissue round the ankle which prevented rectification. It was evident that many of these cases must have been unsuitable from the first for a Chopart's amputation owing to the nature of the injury, and that others might have been successful had the tendo Achillis been divided at the operation, or other measures adopted to maintain the rectangular position of the remains of the foot during the healing process.

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It will I think be evident from what has been said that Chopart's is an excellent amputation when performed in suitable cases, treated with proper care after operation, and fitted with a light simple appliance which gives scope to the natural movements of the ankle. It is interesting to observe that it was adopted by its early advocates for tuberculosis of the anterior part of the foot. For this class of case it gradually fell out of use because of the risk of leaving foci of the disease, not because the operation was otherwise unsuccessful. Now, however, that we have X-rays to guide us, it may sometimes be feasible to give the patient the benefit of this amputation while getting rid of the tuberculous foci.

*Syme's Amputation.*—The very favourable opinion of this operation previously held has been amply confirmed by experience during the war. Some surgeons have advocated a slightly higher section of the ends of the tibia and fibula than Syme recommended in order to diminish the breadth of the stump. This modification, however, is not of much importance. I have met with a considerable number of Syme's stumps resulting from amputation for war wounds in which re-amputation became necessary owing to defects in the stumps. Such failures, as I have already said in regard to Chopart's amputation, cast no slur on the operation itself.

*Amputation through the Leg.*—Considerable confusion has been caused in the minds of readers of text-books by the use of the term "Seat of Election" in connection with amputation through the leg. Originally the phrase was used to indicate an operation a few inches below the knee because at that time the poorer patients were supplied only with peg-legs. For thigh amputations the stump fitted inside a wooden bucket, and for below-knee amputations, the patient bore his weight on his bent knee resting on a pad on the peg-leg. Hence the stump was required to be just long enough for this purpose but not so long as to be in the way by projecting backwards. A length of 2 or 3 inches was sufficient. As, however, improvements were introduced in the art of limb-making, "below-knee" buckets, and not peg-legs, were supplied when it was possible to leave sufficient length of stump to enable the patient to use his own knee joint. Hence "Seat of Election" has a different meaning now. It indicates the length of stump most suitable for a "below-knee" bucket, and as there is a considerable difference of opinion among present-day surgeons and limb makers as to

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what length is really the best for this purpose it seems advisable to drop the term altogether.

On one point all seem to agree. The lower third of the leg should be removed when the conditions do not permit of a Syme's amputation. The tissues in that region are slow to heal and quick to break down, and the additional length is of no importance either for weight-bearing or for leverage. Personally, I would prefer section of the tibia at, or a little below, the middle of the bone, but excellent results can be obtained with shorter stumps. In most cases 4 inches is the shortest length of the tibia which can be satisfactorily fitted with a below-knee bucket, although in a few cases with sound skin covering I have seen good results with 3 inches. One advantage of stumps at the upper end of the tibia is that the section of the bone is through cancellous tissue and permits of a certain amount of end-bearing when the skin covering is sound. When the compact tissue of the shaft is divided, the patient's weight has to be borne partly by the expanded upper ends of the tibia and fibula where they fit the bucket, and partly by the thigh muscles where they are grasped by the leather "saddle" or "corset" which is connected by jointed side steels with the wooden socket below.

In cases where the surgeon has to deal with a case requiring amputation below the knee, but where he cannot hope to leave a stump long enough for a "below-knee" type of artificial limb, he will often feel in doubt as to the best procedure to adopt from the point of view of an artificial limb. There are several alternatives from which to choose and opinions differ with regard to them. The alternatives are:—(1) A short "bent-knee" stump for use with a mechanical leg having an artificial knee joint; (2) a disarticulation at the knee—or "through-the-knee" amputation strictly so called; (3) an amputation through the condyles with or without the Gritti-Stokes use of the patella; (4) an amputation above the condyles. Let us discuss these one by one.

1. *Short bent-knee stump* for use with a mechanical leg, *i.e.*, not with a peg-leg as of old. For practical purposes this is a thigh stump with a knee bearing.

Some recent authorities whose opinions are likely to carry weight consider this stump unsuitable for a mechanical artificial leg. Thus the W. O. Memorandum of 1918<sup>3</sup> says:—

"A kneeling stump is very undesirable, and is only permissible



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when the stump is too tender for end-bearing and the patient is not fit for operation, or when the knee has been allowed to become flexed and it is impossible to straighten it."

Again in the Oxford War Primer on Stumps<sup>8</sup> we find the following:—

"The objections to a kneeling stump are that the kneeling position is not so good as an end-bearing stump through the lower end of the femur, and the artificial leg is rather clumsy owing to the outside joints; the knee also projects unduly when sitting down. A kneeling stump is a good strong stump for a labourer unless the scar on the end is very large and tender, in which case it is better to reamputate through the condyles" (p. 102).

The inference from this statement is that the surgeon is to aim at an end-bearing stump through the condyles as the operation for choice in the neighbourhood of the knee joint.

In contrast with the views of both the authorities just quoted, I have found for practical usefulness bent-knee stump the best of the four stumps now under consideration, and the next best, the disarticulation at the knee. These two give about equally good end-bearing results, but the bent-knee gives greater control over the stump. Both of them require a lacing leather bucket and side steels, but if such are considered disadvantages they are outweighed by the advantages.

It is easy to see why the bent-knee stump gives a greater control over the thigh than any mere thigh stump. By retaining the upper ends of the tibia and fibula the surgeon preserves the insertions of the following muscles which, by taking their origin above the hip joint, act on the thigh at that joint—the sartorius, tensor fasciæ femoris, gracilis, semi-membranous, semi-tendinous biceps, and long head of the rectus femoris. No doubt when these muscles or their tendons are cut in amputations at a higher level fresh cicatricial attachments are formed which are of some value. Still in every case a loss of power to a greater or less amount must result. Moreover, the loss of full action of any group of muscles is detrimental to the action of their normal antagonists. Hence the preservation of muscular attachments at the lower end of a thigh stump must help to maintain the due action of their antagonists attached to the upper end. This is perhaps not a factor of great importance, but it is one which is at least worth considering.

Our experience of bent-knee stumps when fitted with arti-

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ficial limbs at Edenhall has been very satisfactory. I have records of fourteen of such cases. In no case has there been any complaint attributable to the stump, or any desire for a higher amputation. A number of the men, in response to my request for their opinion of the value of their stumps to them for working purposes, have sent me replies.

Pensioner W. M. Temple writes from Carlisle :—

"My bent-knee stump has proved quite satisfactory. My weight is borne on the knee in the same way as a kneeling person bears it. For instance, a person washing a floor. . . . I have given over wearing the shoulder strap as the lacing and bent portion of the knee keep the limb quite firmly on. . . . On six days of the week I walk between three and four miles each day, and on occasions have done walks of three to six miles at a stretch."

Pensioner A. Rodham, Edinburgh, writes :—

"In reply to your letter of 7th August regarding my bent-knee stump, I must say that it has been quite satisfactory. I can bear my full weight on it all right, and the stump has quite a good purchase on the artificial leg. As regards work, I have been for the past six months in Lord Roberts Memorial Workshops. I work eight hours per day on my feet all the time and can get along all right."

Ex-Sergeant A. K. Will with this stump writes :—

"Reference present inquiry. (1) I am able to bear my full weight on the stump without the slightest discomfort. (2) The stump has excellent purchase on the artificial limb either on the level or going up or down hill. When walking I find I can get over on the artificial limb without effort from any other part of the body. (3) . . . I can do eighteen holes at golf quite comfortably in an afternoon."

Another man, Pensioner Martin, writes similarly as to weight-bearing and control of the leg, and adds :—

"I can also stand more weight than any one I have seen who has a leg below the knee."

Pensioner Sprunt, speaking of fourteen months' use of his bent-knee stump after previous experience of the below-knee type of limb for his stump (which was not a good one), says :—

"Since that I have had no bother whatever. I can put my full weight on it and walk with comfort. I have a business of my own, confectionery and grocery, and I work twelve hours per day, 8 A.M. to 8 P.M., and I feel quite as fresh after my day's work as I did before starting."

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Another man, Pensioner Simpson, was able to work on this stump all day as a blacksmith, and when helping his father with his "bit of land" says:—

"I have rolled in corn on soft ground for five hours on end on my leg and felt it pretty comfortable. I wear a belt round my waist with two straps one on the front and one on the back."

He is now learning to be a shoemaker and stands eight hours a day.

2. *Disarticulation at the Knee or "Through the Knee."*—The W. O. Memorial<sup>3</sup> discusses it together with amputation through the condyles. The conclusion is vague:—

"Neither site leaves sufficient room for the ordinary type of artificial knee joint. . . . But these disadvantages" (*i.e.*, lateral joints and a bulky appliance) "are amply compensated for by the improved gait that is ensured by a stump capable of bearing on its end the full body weight. Amputation through the joint, provided the condyles are amply covered, gives a better stump than that above the condyles. The stump given by a transcondylar amputation is usually inferior to both these amputations. . . .

"As a life-saving measure amputation through the knee joint with the longest skin flap procurable is attended with little shock and is most valuable. The patella should be left so that its facial covering may be used at a subsequent operation to cover the end of the femur," *loc. cit.*, p. 14.

Huggins<sup>8</sup> holds that:—

"The most satisfactory stump about the knee is a transcondylar amputation, done near the upper part of the condyles. . . . The condyles of the femur are badly shaped for end-bearing unless the semi-lunar cartilages are left." And he also believes that "To obtain a good stump it is necessary to remove the patella when performing Stephen Smith's operation" (p. 102).

My experience at Edenhall, however, has led me to take up a very favourable opinion of amputation at the knee joint. The objections to it on the ground of side joints, bulky extremity, and special form of bucket required do not count for much as compared with its advantages. I have never seen any disadvantage from the presence of the patella in the stump, while the complication of cutting out the patella would add to the shock of the operation and would interfere with the circulation in the long anterior skin flap.

This stump although losing the muscular attachments of the



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thigh muscles previously referred to retains all the adductors, while the smooth rounded ends of the condyles bear without discomfort the patient's full weight although covered only by skin and fat.

A good illustration of the work that can be done on a through-the-knee stump is given in the following letter from Pensioner Charles King:—

“With reference to your inquiry regarding my amputation which is through the knee of my right leg, I beg to state that I was a plumber previous to the war and am still able to follow out my occupation, which necessitates climbing ladders, working on roofs, bending in all positions, and walking long distances. Besides doing my daily work I am on the leg for about sixteen hours at a stretch. This of course wears me out a little, but with a few hours' rest I am able to go on again. I understand there are words of the amputation being discarded; this, I feel, would be a grievous mistake.”

Another similarly satisfactory report is from Pensioner J. Falconer, who writes as follows:—

“In answer to your letter *re* stumps, my amputation through the knee joint has been very satisfactory.” He then refers to the wounds and goes on, “I was fitted with my leg on 2nd January 1918. I had some trouble with it (artificial leg) for about six months, mostly through the wounds. But now I can walk all day and never have any pain. I have the full weight of my body on the end of my stump, it is so hard now. I have been told, and I think so myself, that through-the-knee is the best amputation of the lot for freedom of sitting, standing, walking, or working. I am working at a branch of the iron moulding trade called core making, some days standing all day and the next sitting.”

In civil practice amputation at the knee joint is recommended for senile gangrene of the foot and leg because the seat of arterial obstruction is frequently at or near the bifurcation of the popliteal artery, while the operation can be performed quickly and without the saw, thus minimising shock. The long anterior skin flap has not been found prone to gangrene in these cases. It has a freely anastomosing arterial circulation of its own. Mr A. G. Miller, whose excellent method of amputating at the knee joint is well known, has frequently operated for senile gangrene and tells me that he has never seen any sloughing of the anterior flap.

Recently I have seen a man with double amputation at the knee for gangrene due to Raynaud's disease. He was fitted

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about eighteen months ago with a pair of artificial limbs which take his weight at the end of his stumps. He walks about fairly well aided by two sticks without any sign of trouble in the skin from impaired circulation. A double amputation is a much severer test for a stump than a single amputation, because in the latter case the sound limb takes more than its own share of the work in walking.

Dr John M'Dougal, late of Cannes, found amputation at the knee joint the best operation for bad compound fractures of the leg in railway accidents, largely owing to its relative freedom from shock.<sup>9</sup>

Although the buckets for the "bent-knee" and "through-the-knee" stumps require to be made of leather and are therefore expensive for the standard types of limb, it seems to be quite feasible to have a cheaper form of limb made for workmen. The end-bearing quality of these stumps will make it possible to simplify the bucket to which the lower part of the artificial limb is fitted.

3. *Amputation through the Condyles of the Femur.*—This has been a common operation during the war for wounds at and near the knee. Even in good stumps, however, I have met with few cases where the full weight could be borne on the end of the stump. Often, however, a part of the patient's weight could be so taken and this was found of advantage. The plan of rounding the sawn surface of the condyles with a butcher's saw at the amputation would probably contribute to successful end-bearing.

I have seen only one case of the Gritti-Stokes' operation among our wounded soldiers. End-bearing on the relatively small end of the stump was not possible and the stump was too long to admit of the knee mechanism of an ordinary thigh stump bucket. I consider the Gritti-Stokes' operation much inferior to amputation through the knee-joint from the point of view of an artificial limb.

When the surgeon wishes the patient to have the usual artificial knee joint and the mechanism known as the "knee control" he must remove at least 3 inches of the lower end of the femur measured from the lowest part of the articular surface, or about 2 inches from the prominence of the condyles. This affords the limb maker the space he requires.

*Thigh Stumps.*—All that need be said about these is that after about an inch of the lower end of the shaft has been

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removed to give space for an artificial knee joint mechanism, the surgeon should try to leave as long a stump of the femur as he can until he reaches a point about 3 or 4 inches from the perineum, which is equivalent to 6 or 7 inches from the tip of the great trochanter. The stump beyond that becomes too short to be effectively grasped by a thigh bucket. It is not, however, always necessary to remove the upper few inches of the femur if the stump of bone can be flexed and is well covered by a flap in that position. A bucket similar to that required for amputation at the hip can be adapted to such a stump of the femur.

*Amputation at the hip joint*, or within a few inches of it.—The stump at this level consists of half the pelvis and requires a special form of bucket known as a "tilting table." This is formed of leather "blocked" on to a cast of the stump so as to fit it accurately. Beyond this is a modified thigh piece bearing the usual knee joint and lower portions of an artificial leg. The "tilting table" is attached to the thigh piece by jointed steels which can be locked by a simple catch when required.

Owing to the need for a pelvic socket and steels besides the usual thigh piece and lower portions of the artificial limb, this type of appliance is heavier than those for amputations further from the trunk. For this reason many men prefer with the tilting table a peg-leg rather than a mechanical leg, as being lighter. The results both with artificial legs and with peg-legs in these cases are surprisingly good. One of the limb makers in Messrs Scotland's workshop is an example. With a tilting table peg-leg he stands at his work all day and is one of the best men in the shop. Another man who wears a tilting table peg-leg attends to a greengrocer's shop of his own and is busy all day. He handles heavy bags of potatoes and vegetables, and puts so severe a strain on his artificial limb that it has frequently broken down. Latterly it has been made extra strong and he does not object to the additional weight thereby entailed.

Fourneau-Jordan's method of amputating at the hip joint leaves an unsatisfactory stump for use with an artificial limb. A large flabby mass of soft tissue is left at the hip, which prevents the tilting table bucket from firmly grasping the pelvis. On this account the patient has no confidence in putting weight on his artificial leg. The limb maker requires a good covering of soft parts but no more.



# Stumps in Relation to Artificial Limbs

In a future paper I hope to deal with stumps of the upper extremity in relation to artificial limbs.

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## THE ANENCEPHALIC SYNDROME IN ITS RELATION TO APITUITARISM.\*

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THE facts set forth in this communication have been arrived at after an examination of five anencephalic monsters. The investigation is still incomplete, and this paper is offered only as a preliminary communication.

Much work has been done by various observers upon the anencephalic fœtus, especially by Ballantyne, who has described some forty-two specimens, and a complete summary of our knowledge on the subject will be found in the *Manual of Ante-Natal Pathology* (The Embryo).<sup>1</sup>

But, so far as I am aware, no one has pointed out the fact that the characteristic physical signs of anencephaly, apart from the absence of the brain and cranial vault, are connected with the absence of the pituitary gland.

Experimental removal of the hypophysis in animals has proved that it is essential to life. Thus Paulesco performed total hypophysectomy upon twenty-two dogs and two cats. His animals lived from ten to forty-eight hours at most. The autopsies revealed neither hæmorrhage nor suppuration at the site of the operation, and the other findings were also negative.

Biedl<sup>3</sup> found that complete extirpation of the hypophysis was followed in both adult and young growing animals by death, and the post-mortem findings were negative. Where the posterior lobe only was removed the animals lived without symptoms for months, ultimately dying of intercurrent disease. It is thus impossible on account of the short duration of life to observe the effect upon other organs of an experimental apituitarism, but in the monster under discussion we have a fœtus which, by virtue of its placental attachment to the mother, is able to develop *in utero* to full term, frequently, at least, without any trace of a pituitary gland. It is obvious that a study of the conditions found post-mortem in anencephaly should yield much useful and hitherto unobtainable information, especially with regard to the inter-relationships of the ductless glands. As John Thomson<sup>2</sup> says, "When we find nature herself practising experimental pathology it is well worth our while

\* Read at a meeting of the Edinburgh Pathological Club, March 1920.

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to investigate as fully as we can the conditions under which she works and the results of her experiments."

Even the most casual examination of the anencephalic foetus will show that there are present certain more or less constant physical characteristics which we may call the "anencephalic syndrome."

## The Anencephalic Syndrome.

These characteristics may be summarised as follows:—

1. Mal development of the basis cranii ;
2. Protruding eyeballs ;
3. Protruding tongue ;
4. Aquilinity of nose ;
5. Large amount of subcutaneous fat ;
6. Hyperplasia of the thymus gland ;
7. Small or absent suprarenal gland ;
8. Hypoplasia of the genital organs ;
9. Stunted growth of the trunk and limbs.

Before proceeding further it is obviously necessary to establish the fact of the absence of the hypophysis. The upper surface of the basis cranii is generally covered by a layer of reddish tissue (*dura mater*?) with some vascular portions, probably *pia mater*, adherent to it and covering the bones. In none of my cases was there anything resembling a brain, and even microscopically nothing is to be found except a connective tissue in which are numerous blood-vessels with very thin walls, some of which show aneurismal dilatations. Sometimes a few nerve cells are found lying between the vessels. No naked eye trace of the hypophysis was found, and sections of the tissue from the upper surface of the sella turcica have failed to show any pituitary cells. This is what we might expect when we consider that the anterior lobe of the gland, though it develops from the primitive buccal cavity, is quite unprotected inside the skull by *dura mater*. The latter forms not a covering for it but a collar around it, leaving an oval-shaped opening through which the hypophysis projects. Thus in the general destruction of the cerebrum which occurs in this condition, probably during the embryonic period of intra-uterine life, the hypophysis does not escape. Doubtless, owing to the unusual density and thickness of the post-sphenoid, no trace of Rathke's pouch was to be found in any of my specimens. The upper surface of the post-sphenoid is convex in shape from before backwards so that there is no protecting depression or fossa hypophyseos, in which the pituitary can rest. This peculiarity in shape is due to absence of the cartilaginous posterior clinoid processes and the ridge (*dorsum sellae*) which



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bears them. Ballantyne says that traces of the pituitary body are rarely seen.

**1. The Abnormalities in the Development of the Basis Cranii.**—Starting from the basioccipital, this bone has almost the normal thickness but only half the normal length from before backwards. It is separated by a disc of cartilage from the post-sphenoid. The sella turcica of the post-sphenoid is a good deal thickened from above downwards. It is a much longer and denser wedge of bone than normal. This is probably due to the hypoplasia of the gonads, to be described later. In birds experimental removal of these leads to abnormal thickening of the body of the sphenoid. The normal post-sphenoid is surrounded in the foetus by a well-defined cartilaginous rim. In the anencephalic this rim is absent or replaced by bone, so that the sella turcica appears much thicker than normal.

No presphenoid can be made out, and only in one of my specimens is there any rudiment of a lesser wing. The orbital plate of the frontal bone measures 2 mm. from before backwards, the normal being about 20 mm. It is covered and overhung by the rudimentary vertical plate of the frontal at an angle of  $15^\circ$ . The latter runs horizontally backwards, the rudimentary supra-orbital plate running backwards and somewhat downwards, so as to form an angle of  $15^\circ$  with the vertical plate. The normal angle is about  $90^\circ$ . Underneath the rudimentary supra-orbital plate is the sphenoidal fissure; there is no optic foramen and the optic nerve and ophthalmic artery traverse the sphenoidal fissure in company with the structures that it normally contains. The frontal bone articulates laterally with the rudimentary squamous, and there is no parietal. Petrous is well-marked, but shorter and thicker than normal, and is not joined to the sphenoid. I mention this because the post-sphenoid in the anencephalic has always been described as having undergone bony ankylosis with the petrous on each side, thus differing from the normal, where even in the adult the bones remain ununited. Thus I have found ossification to be rather less advanced than in the normal foetus, but Ballantyne<sup>1</sup> states that there is an *advanced* degree of ossification present in the bones of the base; that the presphenoid and post-sphenoid are commonly fused together into one bone, and this may likewise be merged with the basiocciput. "The petrous portions of the temporals are short and thick and may be fused with the sphenoid to form a large keystone in the centre of the base of

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the cranium." It should be noted that in acromegaly which is due to hyperpituitarism there is premature obliteration of the skull sutures. It would therefore be strange if it were found in anencephaly. It is certainly not present in any of my specimens.

The ex-occipital is represented by a small rectangular plate of bone that forms the posterior boundary of the basis cranii, and its inner margin forms the outer boundary of the foramen magnum. The latter has no posterior boundary. The floor of the posterior fossa of the skull is formed of cartilage, but between the ex-occipital and the basioccipital is a small, thick triangular bone about the shape and size of a split-pea. It fits in between the inner end of petrous in front, and ex-occipital behind, and assists the latter in forming the lateral boundary of the foramen magnum. The floor of the middle fossa is formed of a short and stumpy great wing of sphenoid which springs from the base of the thickened sella turcica.

There is a fairly accurate description of the basis cranii in my five specimens, all of which were examples of holo-acrania, that is that in them the *whole* cranial vault and cerebral tissues were absent. It is interesting to note that Aschner in young animals found that partial removal of the hypophysis was followed by *shortening of the skull* and *especially of the muzzle*, and the animals were backward in growth and weight.<sup>3</sup>

**2. The Protruding Eyeballs.**—This is one of the most characteristic features of anencephaly, and is invariably present. I have taken measurements of the depth of the bony cavity of the orbit, and these are briefly as follows:—

The normal orbital cavity in the foetus measures from before backwards, along its upper part from the supra-orbital notch to the most posterior part of the sphenoidal fissure, 2 cm.; in the anen, it is  $\frac{1}{2}$  cm., or  $\frac{1}{4}$  of the normal. Measured along the lower part of the cavity the antero-posterior diameter is 3 cm. in the normal foetus; in the anencephalic it is 1.5 cm., or half the normal. At the same time the cavity is triangular in shape with the apex of the triangle posterior, whereas the normal orbital cavity in the foetus is circular in shape. It is this smallness of the orbital cavity with its abnormal shape which accounts for the exophthalmos. A minor cause of the protrusion is an *abnormally large pad of fat behind the orbit*. Indeed, the whole *bony* orbital cavity is occupied by the fat pad, the eyeball being quite uncovered by bone.

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3. **The Aquilinity of the Nose.**—This is due to increase of the subcutaneous fat between the skin and the nasal bones, and also to the fact pointed out above—that the vertical plate of the frontal bone runs horizontally backwards instead of rising perpendicularly from the orbital plate to form the normal forehead.

4. **The Protruding Tongue.**—This is due, not to enlargement of the organ, but to *smallness of the mouth-cavity*. Thus the mouth-cavity of the normal foetus, measured from the anterior pillar of the fauces to the lower margin of the upper alveolus, is 5 cm., and the tongue of the full-time foetus is 4 cm. In Anencephalic 1, the mouth-cavity is 3 cm., and tongue 4 cm., and the tongue in this case protruded  $\frac{1}{2}$  cm. beyond the upper alveolar margin. In only one of my cases was the tongue excessively thick and large. Sections of the tongue showed that the excessive thickness is due entirely to great muscular development, there being no increase in the connective tissue. The bony roof of the mouth is shortened in the same proportion as the mouth-cavity and is not arched as in the normal foetus, but runs horizontally backwards, or even sometimes with the convexity downwards. This tends to decrease still more the space available in the mouth. *There is no doubt that the protrusion of the tongue is due to under-development of the mouth-cavity.*

It is interesting to note that in acromegaly, which is due to *increased* pituitary secretion, a prominent feature is enlargement of the tongue, the enlargement being due to connective tissue proliferation and hypertrophy of the mucosa. The tongue in this condition may be so large as almost to prevent the closure of the mouth.

5. **Increase of the Subcutaneous Fat.**—This also is a constant feature in anencephaly, though it varies considerably in amount. The fat accumulation is greatest at the root of the neck and over the upper part of the chest. Thus in Anen. 2 it measured 1 inch deep over the manubrium sterni, but it is also abnormally developed over the entire body and limbs, as also around the kidneys and behind the peritoneum. The fat is of the embryonic type, hard and somewhat cheesy in consistence and greyish white in colour. In these respects it resembles exactly the fat formed in the normal foetus. This increased adiposity is the most constant sequela of hypopituitarism in the adult whether this be due to disease or is



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produced experimentally, and with the hypoplasia of the genital organs constitutes the dystrophia adiposa genitals first described by Frohlich in 1901. I shall show later that there is also a hypoplasia of the gonads in the anencephalic foetus.

*Microscopically.*—Frozen sections, stained by Sharlach R., show that the fat droplets vary much in size, but are considerably smaller than those of an adult fat. This increase of the fat body is due to absence of the *posterior* lobe of the pituitary *pars nervosa*, which is said to control carbohydrate metabolism, its absence increasing the patient's tolerance for carbohydrates.

6. **Thymus.**—The size of the thymus in anencephaly is very inconstant. Thus in Anen. 1 it was a large octopus-looking structure, 20 grams in weight, and consisting, in addition to the main mass, of several smaller lobes or finger-like prolongations. It extended into the right side of the chest as far as the outer end of the clavicle, and downwards into the lung space on this side. The lungs, in consequence of this compression, were merely rudimentary, and the right lung had but two lobes. The main central mass of the thymus extended downwards in front of the pericardium as far as the diaphragm. At that time the possibility of it being due to absence of the pituitary gland had not occurred to me, and I thought that such an abnormal-looking organ had some etiological connection with the monstrosity as a whole.

The weight of the thymus in the normal foetus varies a good deal: thus, in a full-time foetus, weighing 2400 grams, the thymus weighed 15 grams, whereas in another, weighing 3.900 grams, the thymus weighed only 7 grams. I found that in five full-time babies, selected at random from my post-mortem records, the thymus weighed, on an average,  $\frac{1}{33.0}$  of the body-weight. In Anen. 1, the proportion to body-weight was 1 in 100; in Anen. 2, 1/160; in Anen. 4, 1/100; that is, the thymus is from two to three times the normal size in proportion to body-weight. I have described the naked-eye appearance of the thymus in Anen. 1; in Anen. 4, it presented a similar appearance, one large lobe occupying almost the entire left side of the chest, completely concealing the rudimentary lung which lay behind it. Behind and between the great vessels of the neck, other prolongations extended, so that it was only by very careful dissection that the gland could be removed entire.

*Microscopically.*—The thymus presents no change, unless it be that the Hassals corpuscles are larger than normal, and the

whole gland, especially the medullary part of the lobule, more vascular than usual. However, as the vascularity of the normal gland varies much, as also the size of the corpuscles of Hassal, it is difficult to say that these are definitely abnormal. Blair Bell found that partial removal of the pituitary in animals caused hypertrophy of the thymus, but there was no change microscopically in the enlarged organ. It is strange, too, that a hyperplastic thymus is by no means a rare finding in acromegaly, but it is not improbable that this is really due to a terminal condition of hypopituitarism from partial destruction of the pituitary, following upon a true acromegaly due to adenomatous formation in the gland.

In considering the cause of the thymus enlargement we must also take into account the hypoplasia of the genital organs found in anencephaly. Blair Bell found that in cats oophorectomy caused thymus hypertrophy, and Calzolari found that removal of the sexual glands in rabbits was followed by hypertrophy of the thymus. Noël Paton found that the atrophy of the thymus was arrested in guinea-pigs after castration.<sup>3</sup> It therefore seems probable that there is an important inter-relationship existing between the thymus and the genital organs, and it is questionable how far the thymus enlargement is due to the hypoplastic condition of the ovaries in the anencephalic foetus, rather than to the apituitarism. However, in the one specimen of anencephaly in which the hypoplasia of the ovary was least marked, the enlargement of the thymus was most marked, and its shape most abnormal; and, personally, I have no doubt whatever that the apituitarism is the causal factor.

**7. Suprarenals.**—In the anencephalic monster the suprarenals are always exceedingly small, and may even be entirely absent on one or both sides. The weight of the normal suprarenal in the foetus varies within fairly wide limits, but is at all times much greater in proportion to body-weight than in the adult. In the normal full-time foetus it weighs from 2 to 5 grams. In the anencephalic it weighs about  $\frac{1}{2}$  gram. So far as I am aware there has been no instance recorded of a normal-sized suprarenal in this condition.

With regard to its histological appearances it will be necessary to refer briefly to a few points in the structure of the normal foetal and adult suprarenals in order to make plain that of the anencephalic. The suprarenal of the normal full-time

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fœtus has fairly definite histological characteristics (Fig. 1). Immediately underneath the capsule is the zona glomerulosa, consisting of small polygonal cells, arranged in groups of a dozen or so. These cell-groups have no lumen, but they are frequently to be found arranged around a blood-vessel. This layer in the normal fœtus is very little marked, and, indeed, sometimes is found to be absent altogether, as it is in some mammals. Underneath this layer is the zona fasciculata, which forms a narrow rim between zona glomerulosa and zona reticularis. Its cells are arranged in parallel columns, each column being two cells wide and separated from its neighbour by a few strands of fibrous tissue, which grow inward from the capsule. These cells are easily distinguished from those of the next layer by the fact that the protoplasm is clear, vacuolated, and non-pigmented. The vacuolation and the non-pigmented character of the cells are well seen in paraffin sections, treated by xylol to dissolve the lipid granules. The main thickness of the cortex is composed, however, of the next layer—the zona reticularis. The cells of this zone are arranged in narrow columns one or two cells broad, the columns, interweaving with one another, so as to form a network, hence the name. The individual cells are large and characteristically pigmented, so that in sections stained by cosin they appear to contain granules of a brick-red colour. This layer constitutes the main part of the fœtal cortex, being from two to six times the size of the other two layers put together. All the cortical layers contain lipid granules, known as the "cortical granules," which stain with ordinary fat stains.

In the adult gland (Fig. 2) the proportion between the two main layers of the cortex is greatly altered, so that the fasciculata occupies the greater part of the cortex, the reticular layer being now reduced to comparatively small proportions. It is remarkable, however, that the zona fasciculata has now become pigmented with the brick-red granules which are only found in the reticularis in the fœtus, so that generally the pigmented layer of the cortex in the adult extends outwards as far as the capsule. It is, therefore, I think, questionable if the really functional reticular layer is diminished in the adult at all, and if it is not simply a rearrangement of its cells that has taken place, probably by a further ingrowth of the bundles of fibrous tissue that in the fœtus separate the columns of the zona fasciculata.



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I mention this because Elliott and Tucker,<sup>4</sup> who have done the most recent work on this subject, state that the change is due to a gradual disappearance of the zona reticularis by means of a fatty degeneration occurring in its cells, and that this fatty degeneration starts in a child from the twelfth day of its age, and is completed about the end of the first year. In support of this they state that they find fat droplets in the cells of the reticularis at this period. But I have always found fat droplets in the cells even when the child is still-born, and even in premature still-born babies. They are simply the ordinary lipid granules which are present in *all* the cortical layers, but which these observers wrongly state are confined to the two outer zones of the cortex.

These workers also examined the suprarenals of one, an encephalic foetus, and found that it had the same histological structure as in the adult gland. They concluded, therefore, that the small size of the suprarenal in anencephaly was due to absence of the large zona reticularis, and that the rim corresponding to the adult cortex was almost normal. So, too, was the system of chromaffin cells. The gland was therefore a miniature of that of an infant of a year old in which nearly all vestige of the zona reticularis had disappeared.

In my specimen the arrangement of the layers is as follows (Fig. 3):—

Immediately underneath the capsule is a very well-marked zona glomerulosa. This is far more highly developed than in the normal cortex.

At parts the zona fasciculata is normally developed, and the arrangement of the cells in parallel columns is similar to that found in the normal foetus. At most parts, however, the cells have an indefinite reticular arrangement, resembling the cells of the reticular zone. They are, however, unpigmented, and they resemble the cells of the fasciculata in shape and size. This zone is from two to three times the thickness of the zona fasciculata in the normal foetus. Inside this and between it and the medulla is the zona reticularis. While this is certainly less thick than normal, yet it is by no means a mere strip, as Elliott and Tucker have described, but constitutes roughly about half the entire cortex. The chromaffin tissue of the medulla is normal in amount. As to the significance of the changes in the suprarenal, I am unable to

FIG. 1.

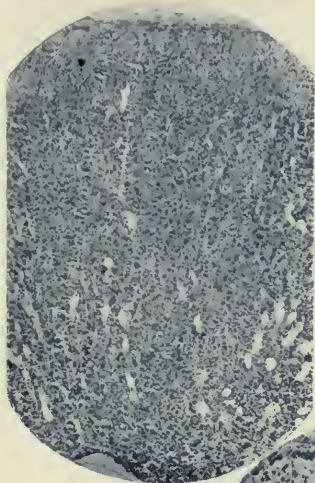


FIG. 2.

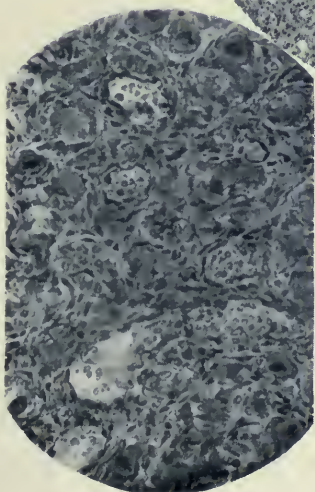
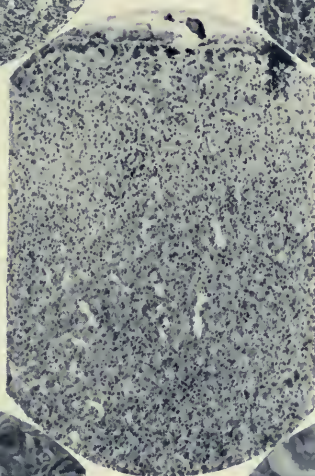
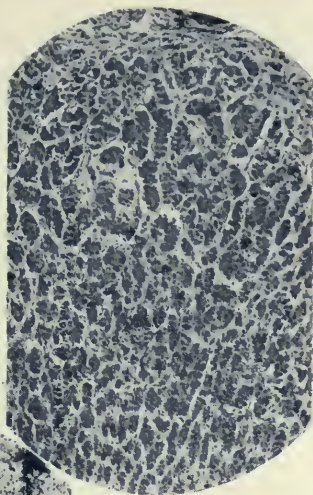


FIG. 3.

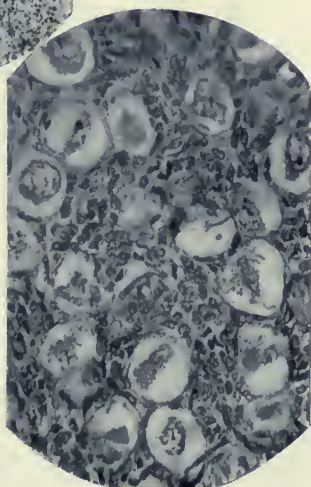


FIG. 4.

FIG. 5.





## Anencephalic Syndrome and Apituitarism

throw any light upon them. Little or nothing is known regarding the functions of the different layers of the cortical zone, and it is difficult to see how such a knowledge can be arrived at experimentally or otherwise. One point I might draw attention to, however, is that there is a certain *similarity in grouping, absence of lumen, in staining reaction and in general appearance between the cell of the zona glomerulosa and those of the anterior lobe of pituitary gland*. Is it possible that there is an attempt at a compensatory hypertrophy of these cells in the suprarenal cortex?

It has been suggested that the suprarenal gland is normally a factory for lipoids for use by the central nervous system, and this may explain its diminutive size in anencephaly, apart altogether from any connection between it and apituitarism. However, the possible connection should be kept in mind, as also the possible *secondary effect of the hypoplasia of the ovaries*. Blair Bell<sup>5</sup> found that oophorectomy in rabbits and cats led to a definite increase in the zona reticularis at the expense of the fasciculata. He thinks that the removal of an antagonistic secretion leads to hypertrophy of the reticularis. The enlargement of the suprarenals in pregnancy points to a definite relationship between these glands and the genital system.

As to the relationship between the pituitary and the suprarenals there have been very few investigations. After extirpation of the suprarenals Alquier found moderate hyperplasia of the hypophysis, while Marengi found marked hypertrophy in the pituitary of guinea-pigs, rabbits, and cats. Adenoma and cystic degeneration of the suprarenals have been observed in acromegaly, and Delille and Renan *point out that hyperplasia of the suprarenals may be produced by the repeated intraperitoneal injection of pituitary extract*. It is not unlikely, therefore, that apituitarism would lead to smallness of the suprarenals such as we find in anencephaly.

**8. Genital System.**—To the naked eye the genital organs in anencephaly appear to be normal. Microscopically there are quite definite changes in the ovaries (Fig. 4) of the nature of hypoplasia of the follicles. The latter are small, the protoplasm of the ovum is filled with a finely granular eosinophile material, but the chief change is observed in the nucleus. This is often indefinite in outline and its chromaffin network weakly staining and eosinophile, whereas that of

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the normal nucleus stains well with hæmatin. Generally, however, the nucleus is altogether structureless, and hyaline in appearance, and no nuclear figures can be made out. One, however, also finds follicles in which the ova are fairly normal, though such are very few in comparison with the large numbers of degenerate ova present.

Experimentally it has been proved that removal of part of the anterior lobe of the pituitary causes hypoplastic changes in the sexual glands. In male animals spermatogenesis ceased. In females there was involution of the ovarian follicles. Blair Bell has found that the follicles underwent a hyaline degeneration.<sup>5</sup>

The uterus appears normal microscopically. This was an unexpected finding, as experimental removal of the greater part of the anterior lobe of the pituitary invariably causes intense atrophy of the uterine musculature, and of the endometrium.

In this connection it should not be forgotten that there are in this investigation two possible sources of error:—(1) The pineal gland is wanting as well as the pituitary. (2) It is a possibility that the mother's internal secretions make up to some extent for any defect in those of the foetus, though this is a point in foetal physiology that has never been settled and of which, indeed, nothing is known.

With regard to the pineal gland, clinical observations in cases where the pineal gland is destroyed by disease show that this is accompanied by remarkably increased and premature development of the sexual organs, together with abnormal growth in height. "Until the seventh year the pineal gland exercises a definite and apparently inhibitory influence upon the development of the sexual glands, and it is possible that it has a secondary effect upon mental development. The destruction of the gland at this stage leads to physical and mental precocity. That there is an antagonism between the activity of the pineal gland and that of the pituitary is certain, for we know that pituitary insufficiency leads to hypo-genitalism."<sup>3</sup>

Before discussing this point further I shall briefly refer to the last of the physical characteristics of the anencephalous foetus that I shall take note of, viz. :—

**9. Stunting of the Growth.**—I have taken measurements of the trunk, thighs, and legs of all my specimens and compared them with the corresponding measurements in a normal foetus of the same period of development. The measurements are

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considerably less in the anencephalic, so that, allowing for the absence of the cranial vault, and for the lordosis of the spine in the upper dorsal and cervical regions which is so commonly present in these cases, there is a shortening of about 4 to 5 inches in the whole skeleton. The formation of the long bones is, however, quite normal, as also is the ossification. The bones of the face, too, are much smaller than normal, so that the face itself is reduced in size, and would be much more reduced but for the abnormally thick layer of subcutaneous fat. I think that the stunted body growth would be even more marked but for the apinealism and the apituitarism in this case, as in the genital system, working in antagonism to each other.

With regard to the obesity on the other hand the case is different, for destruction of the pineal gland by disease leads to increase of the fat body, just as the absent pituitary does. The obesity is therefore probably greater than it would be if it were due to apituitarism alone, while the hypo-genitalism and the stunting of growth are less marked.

The constancy of these changes, and the fact that they so closely resemble the dystrophia adiposo-genitalis produced experimentally or by disease, seem to show that *the internal secretions of the mother play no part, or at most a very minor one, in the development of the fœtus*, seeing that they seem to have no effect in compensating for the secretions that are wanting in anencephaly.

It is evident also that the *endocrine glands of the fœtus itself play an extremely important part in its development in utero*.

In the thyroid and pancreas no constant changes, either naked eye or microscopic, have so far been observed, but these and the bone marrow are still under investigation. Enough has, however, been said to show what a Gordian knot is the problem of the inter-relationship of the ductless glands, and that in the hitherto despised anencephalic monster there is available material by means of which much needed light may be shed upon many disputed questions in physiology and pathology, and perhaps some of them even solved.

REFERENCES.—<sup>1</sup> Ballantyne, *Manual of Ante-Natal Pathology*—The Embryo. <sup>2</sup> J. Thomson, *On Congenital Obliteration of the Bile Ducts*. <sup>3</sup> Biedl, *The Internal Secretions*. <sup>4</sup> Elliott and Tucker, *Journal of Pathology and Bacteriology*, 1911, vol. xv. <sup>5</sup> Blair Bell, *The Sex Complex*.



## ACUTE APPENDICITIS AND ACUTE APPENDICULAR OBSTRUCTION.\*

By D. P. D. WILKIE, M.Ch., F.R.C.S.

THE practice of submitting patients suffering from acute appendicular disease to early operation has of late years afforded surgeons the opportunity of observing the pathology of the initial stages of the disease. This study has shown that altogether different primary lesions may, if permitted to develop, lead to the same final result of perforation and peritonitis. To attain to accuracy in early diagnosis, it is essential that we learn to correlate the initial symptoms with the primary lesions—in other words to have a rational basis of pathology on which to found the symptomatology of the disease.

My personal observations on the subject have led me to classify the acute diseases of the appendix according to the following types:—

- (1) Acute inflammation of the wall of the appendix.
- (2) Acute obstruction of the lumen of the appendix.
- (3) Perforating ulcer of the wall of the appendix.
- (4) Acute inflammation with secondary acute obstruction.

Type 3 is well recognised as giving rise to a fulminant attack with peritonitis. In it an ulcer, usually associated with the presence of a concretion, perforates with little or no warning, and, as there are frequently streptococci as well as the colon bacillus present in the ulcer, a dangerous type of peritonitis supervenes.

My main object in this paper, however, is to draw attention to types 1 and 2, and to endeavour to establish their fundamental differences both as regards pathology and symptomatology.

The wall of the appendix, being rich in lymphoid tissue and exposed to a content full of micro-organisms, is particularly liable to attacks of inflammation just as are the tonsils. As might be expected, primary inflammation of the wall of the appendix is associated with malaise, a certain rise of temperature and of pulse-rate, with nausea and it may be

\* Communicated to the Medico-Chirurgical Society of Edinburgh, 3rd March 1920.

## Appendicitis and Appendicular Obstruction

vomiting, and with pain more or less severe in the lower abdomen gradually settling on the right side as the parietal peritoneum in that region becomes irritated. The appendix being a hollow viscus is, however, also liable to have its lumen obstructed, and I hope to show that a sudden obstruction of the lumen of the appendix may, under certain conditions as regards its contents, lead to changes much more striking than those associated with inflammation of its wall, and moreover that these changes produce a train of symptoms distinct from those of inflammation, and such as one would expect in obstruction of a blind hollow viscus.

My attention was first directed to this essentially obstructive type of lesion eight years ago by the case of a man who at 5 P.M. one evening was seized with acute abdominal pain which doubled him up; the pain lasted for half an hour and then passed off, only to return an hour later accompanied by vomiting. From that time the pain remained but was accentuated from time to time by severe spasms. Seen by his doctor at 8 P.M. he had severe pain, but his pulse and temperature were normal. When I saw the patient at 10 P.M. he was doubled up with pain, which he located in the umbilical region. There was marked hyperæsthesia of the whole of the right side of the abdomen. His temperature was 99° F. and his pulse 80. Diagnosing a perforation, probably of the duodenum, I opened the abdomen at 11.30 P.M. The duodenum and stomach were normal, but a large tense and distended appendix was felt and was removed through another incision. The wall of the appendix was stippled with points of gangrene except the proximal  $\frac{1}{2}$  inch, which was of normal size and colour. On opening the distended appendix it was found to contain stinking fæculent material pent up beyond a concretion which was impacted in a stenosis half an inch from the cæcal end. Here one was obviously dealing with an acute obstruction and not an inflammation, and the question arose, Will a complete obstruction of the lumen of the appendix containing fæcal matter lead *per se* to the rapid and striking pathological changes met with in this case? The question was one readily lending itself to experimental investigation. Accordingly a long series of experiments was carried out on cats and rabbits to endeavour to settle this point.

**Experimental Appendicular Obstruction.**

In rabbits a rubber ligature was tied round the proximal end of the appendix without interfering with the blood supply of the organ. In a certain number of rabbits the empty appendix was obstructed in this way, in others a small amount of faecal matter was introduced from the cæcum before applying the ligature; in a further series a considerable amount of faecal matter was introduced.

The result of ligation of the empty appendix was to produce a mucocele of the organ, the health of the animal not being interfered with to any appreciable degree.

When a very small amount of faecal matter was present at the time of ligation an empyema of the appendix resulted, the organ becoming gradually more and more distended with pus and in some cases perforating.

When a considerable quantity of faecal matter was introduced rapid gangrene with perforation of a portion of the wall followed with a fatal result within twelve to forty-eight hours.

In view of the purely vegetarian character of the diet of the rabbit, and the readily fermentable character of the caecal content of that animal, together with the relative fragility of its intestinal wall, it was decided that experiments on a mixed-feeder such as the cat with its muscular intestinal wall would give a better field for comparison with the conditions in the human subject. The cat, not possessing an appendix, had to be furnished with an artificial one. This was done by isolating the last coil of ileum, which is rich in lymphoid tissue, restoring the continuity of the intestinal tract. The behaviour of this isolated coil of ileum was then observed (1) when left empty; (2) when containing a small quantity of faecal matter; (3) when more or less full of faecal matter. The results were the same but were even more striking than in the experiments on rabbits.

The empty loop formed a mucocele; the loop containing a small amount of faeces an empyema, which eventually ruptured if left; whilst the loop containing a considerable quantity of faecal matter became rapidly gangrenous. When the loop was filled with an emulsion of intestinal bacteria grown on culture no striking changes supervened although in some cases it slowly filled with a muco-purulent content.



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Decomposition of faecal matter appeared to be the factor inducing the rapid pathological changes met with in the group of rapidly fatal cases. It was found, moreover, that the gangrene was more rapid and pronounced if the animals had previously been fed on a rich proteid diet than if they had been given a more purely carbohydrate diet, *e.g.*, porridge and milk.

The pathological changes seen in these experiments resembled so closely those seen in certain cases of acute appendicular disease in the human subject that one ventured to assert that the primary factor, namely obstruction, must be the same in both.

A mucocoele of the human appendix is a condition occasionally met with owing to an obliteration of the proximal end, the result of a preceding attack of inflammation. As in animals, it causes, as a rule, few if any symptoms.

An empyema of the appendix is also met with, and in my experience has been associated with the plugging of a stenosis or kink in the appendix near its caecal end by a concretion. Complete gangrene of the appendix is a fairly frequent finding at operation, and has by many been attributed to a thrombosis of the vessels in the meso-appendix. Whilst thrombosis is sometimes present I am convinced that it is an effect and not the cause of the gangrene. If such an appendix be removed before perforation has occurred it will invariably be found to contain not pus but dark stinking faeculent material pent up under tension behind some obstruction of the lumen, and the condition appears to be strictly comparable to that in the experiments on rabbits and cats, where faecal matter was locked up in the appendix, or in an isolated loop of intestine.

## **Causes of Acute Appendicular Obstruction.**

The two common causes are the impaction of a concretion either in a stenosis the result of a previous attack of appendicitis, or at a kink in the appendix due to tacking down at some point by an adhesion (see Fig. I.) or a congenital fold of peritoneum. Of kinks the one most frequently encountered is that where the genito-mesenteric fold ties the appendix at some point, usually in its middle third, downwards towards the pelvic brim (see Fig. II.) Apparently in these cases the entrance and exit of faecal matter to and from the distal part of the appendix is impeded by the stenosis or kink, and faecal matter

when it has gained entrance is liable to remain and become hardened to form a concretion. From time to time the concretion may lead to temporary and abortive attacks of obstruction, the patient experiencing appendicular colic. On one occasion, however, more faecal matter gains entrance beyond the narrowed zone, the appendix contracts to expel it, but instead forces the concretion into the stenosis or kink. If the concretion does not disengage itself promptly the fermentation of the faecal matter increases the tension behind it and effectively ball-valves the exit in a manner similar to that of a soda-water bottle. Progressive fermentation and distension with inevitable gangrene and perforation follow unless the process is cut short by surgical intervention.

Another cause of obstruction of which I have recently encountered three examples is carcinoma developing in the proximal end of the appendix. In one case this led to an empyema of the appendix distal to the growth; in another, where a concretion and faecal matter were present, to gangrene and perforation.

#### **Clinical Picture in Acute Appendicular Obstruction.**

In some cases the sudden onset of symptoms so characteristic of the malady may develop without any previous history of trouble in the appendix region. In many cases, however, careful inquiry will elicit a history of intermittent colicky pains or of occasional "bilious attacks" with more or less pain in the right side of the abdomen. In a few cases "indigestion" after eating green vegetables has been the only previous suggestive symptom. The acute attack begins suddenly with acute pain in the umbilical region frequently accompanied by vomiting. Whilst in a number of cases it has been noted that the pain commenced during or just after some physical exertion, in quite a large number it set in at night whilst the patient was in bed, waking him out of sleep. The pain is of an acute colicky nature, and to begin with is intermittent, coming on in spasms. After a short time, however, it is constant, but is aggravated by more acute spasms from time to time. Perforation of the distended appendix is commonly marked by a temporary relief from pain, the patient expressing himself as being much easier, although a rising pulse-rate indicates a spreading peritoneal infection. For the first few hours (it may even be twelve hours or more) there may be no rise in the temperature

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nor in the pulse-rate, and negative observations under these two heads must be disregarded entirely if early diagnosis is to be made.

The facies of the patient often gives help as it expresses anxiety, and he is usually conscious that there is "something wrong inside" and welcomes the suggestion of surgical interference.

For diagnosis, however, we must rely mainly on the physical examination of the abdomen. Cutaneous hyperæsthesia in the right lower quadrant of the abdomen is usually present in the early stages although it may disappear once the appendix has perforated. Rigidity of the lower half of the right rectus muscle is almost always present, as is tenderness on pressure in this region. Most difficulty is encountered where the obstructed appendix is lying high up in the retrocæcal region, but even here some hyperæsthesia of the skin above M'Burney's point, together with tenderness in the lumbar region posteriorly, and a normal urine incriminate the appendix. The importance of making a diagnosis on the local signs cannot be over-emphasised because in these cases to wait for changes in the temperature or the pulse-rate so frequently means delaying until gross pathological changes have supervened and the danger zone has been entered.

## **Acute Appendicitis with Secondary Obstruction of the Appendix.**

The combination of primary inflammation with secondary obstruction is unquestionably of frequent occurrence. In this case the swelling and œdema of the coats of the appendix associated with a primary infection of the wall narrow the lumen, and at some point may, with or without the aid of a concretion or a kink, occlude it. Muco-purulent content then collects distal to the obstruction, and gangrene, usually localised in this case, and perforation follow.

The symptoms in this type of case are, to begin with, those of a simple inflammation with some fever, a slightly accelerated pulse-rate, dull aching pain and local tenderness. When the obstructive element supervenes the pain becomes more acute, with the characteristic spasmodic exacerbations. Perforation, as in primary appendicular obstruction, is often associated with a relief from acute pain but with a progressive rise in the pulse-rate. If in the early stages of such a case there has been any



doubt as to the necessity for operation the onset of the more acute spasmodic pains is a signal for prompt surgical intervention.

**Conclusions.**

(1) Primary acute inflammation and primary acute obstruction of the appendix are distinct pathological and clinical entities.

(2) Complete obstruction of the lumen of the appendix near its cæcal end is followed by changes which depend on the presence or absence of fæcal content in its lumen: (*a*) Obstruction of the empty appendix leads to a mucocoele; (*b*) if very little fæcal matter is present, to an empyema; (*c*) if much fæcal matter is present, to gangrene and perforation.

(3) To recognise the obstructive cases in their early stages the state of the temperature and pulse-rate must be ignored and diagnosis based entirely on the facies and the local examination of the abdomen.

# CLINICAL RECORD

## A CASE OF PELLAGRA.

By R. CRANSTON LOW, M.B., F.R.C.P., Assistant Physician to the Skin Department of the Royal Infirmary, Edinburgh; and HENRY YELLOWLEES, M.D., F.R.F.P.S. Glas., Senior Assistant Physician, Edinburgh Royal Asylum.

CASE.—Mrs M. J., aged 47, was admitted to Craig House on 6th April 1920 with the following history.

She has been really ill for about two years and a half. The onset was rapid and indeed almost sudden, her husband being able to fix almost the very day on which she suddenly became not only mentally depressed but very weak and helpless physically. Her medical adviser considered that she was suffering from a toxæmia of some description, and on two occasions during her illness the house drainage and sanitary arrangements have been completely inspected and overhauled without any defect being found. She dragged on during this period spending weeks at a time in bed, and then feeling better for short periods. Before admission she had spent a total of twenty-four weeks in bed. In addition to the physical weakness and mental depression, she has complained of feelings of abdominal distension and discomfort. She has never suffered from diarrhoea nor from any acute digestive disturbance, though her digestion has always been "weak" and liable to be upset by certain specific articles of diet, as, for example, strawberries. Many years ago, even before her marriage, her husband used to notice that her complexion was frequently of an unhealthy yellowish appearance. She has been married fourteen years and has no family. Her mother was always "nervous," and sustained a severe shock a week before the patient's birth by witnessing a fatal street accident. For six years before her marriage the patient shared with her sister the duty of nursing her father, who had been greatly upset by financial difficulties and had attempted to commit suicide by cutting his throat. This strain had a bad effect upon both the sisters, the patient becoming nervous and unhappy, while her sister suffered more in physical health. She has never been known to suffer from any skin eruption of any kind, and, with the exception of a short visit to France in girlhood, she has never been abroad.

On admission she was in a fairly typical state of melancholia, with delusions of unworthiness and suspicion, hallucinations of hearing, and a certain amount of restlessness and agitation. Suicidal tendencies were certainly present, and she herself had mentioned suicide before admission, but there has been no definite attempt. Physical examination revealed nothing beyond very brisk reflexes; and there were operation scars for the removal of cysts on left breast.

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On 3rd June, as the day was bright and sunny, the patient was out all day on a verandah, and on the following day it was noticed that the face was red and blistered and had all the appearances of a severe sunburn. It was not thought necessary to keep the patient indoors on the next few days, which were dull. On 8th June the condition was worse, the lesions on the cheeks and chin becoming much crusted and an eruption making its appearance on the backs of hands and wrists. On 10th June the eruption affected the forehead, cheeks and chin, backs of hands, including fingers and wrists. All the lesions had a peculiar brick-red colour and their margin was sharply outlined from the healthy skin. In the central part of the lesions the skin was covered with oozing areas and yellow crusts where the blisters had burst. The edges of the affected areas were scaly, and these scales showed a brownish discoloration. In addition to the lesions on the face, hands, and wrists, there was also a roundish patch about the size of a florin on the lower part of the back of the neck over the vertebra prominens. This area was sharply outlined, brick-red in colour and covered with scales, which were grey in the centre and brownish at the edges of the patch. Under the application of a 1 per cent. ammoniated mercury paste, and washing with soap and water and weak Condy's fluid, all the lesions disappeared in about seventeen days. There has so far been no recurrence, and at present (18th August) the skin is free from eruption.

We do not propose to enter into any discussion as to the cause of pellagra, but desire simply to record the case as one which is typical in every way of that disease. The mental symptoms and the severe eruption after exposure to sunlight are sufficient basis on which to form a diagnosis. In addition, the brick-red colour of the affected areas, their sharp margin with blisters and crusts in the centre and brown scales at the edge, and their development on the exposed parts are quite characteristic. The fact that there were no gastro-intestinal symptoms is not against the diagnosis, as few cases of pellagra show all the classical symptoms. The diagnosis in such cases is made from the skin condition, and it is only from it that they can be recognised.

We are convinced that many cases of pellagra are undiagnosed because the skin lesions are absent or so slight as to pass unnoticed. In this country the sunlight is not so intense as in Italy and other countries where pellagra is endemic, and unless such cases are directly exposed to the sun the eruption may not appear at all.

We are indebted to Professor Robertson for kindly allowing us to publish this case.



## CRITICAL REVIEW

### GOITRE AND EXOPHTHALMIC GOITRE.

By ALEXANDER GOODALL, M.D., F.R.C.P., Assistant  
Physician to the Royal Infirmary, Edinburgh.

WITHIN recent years there have been some violent swings of the pendulum concerning the advisability of giving iodine in these conditions. An editorial in a recent number<sup>1</sup> of the Journal of the American Medical Association sums up the results of some interesting observations on the use of sodium iodide as a prophylactic of simple goitre.

Approximately half of the young girls examined in some of the public schools in the region of the Great Lakes show a detectable enlargement of the thyroid.

Some hundreds of observations are now available in the case of schoolgirls at Akron, Ohio. Sodium iodide in an arbitrary dose of three grains was given daily for ten consecutive school days, repeated each spring and autumn. There was a striking difference between those taking and those not taking iodine. The difference is manifested both in the prevention of enlargement and in the decrease in the size of existing enlargements. Of 2190 pupils taking the iodide twice yearly, five have shown enlargement of the thyroid, while of 2305 not taking the iodide 495 have shown enlargement of the thyroid. Of 1182 pupils with thyroid enlargement at the first examination who took the drug, 773 thyroids decreased in size, while of 1048 pupils with thyroid enlargement at the first examination who did not take the iodide, 145 thyroids decreased in size. It might be supposed that toxic conditions such as give rise to the symptoms of hyperthyroidism would occasionally arise under the treatment indicated, but this does not seem to have been the case. An occasional child showed signs of iodide rash which disappeared as soon as the treatment was stopped. The untoward effects of iodine idiosyncrasy was apparently negligible. Marine and Kimball<sup>2</sup> conclude that in the region in which they have been concerned, probably the maximum of prevention coupled with the minimum of effect would be obtained by giving the iodide between the ages of eleven and seventeen years. A thyroid enlargement is approximately six times as common in girls as in boys. The question of including both sexes in systematic treatment may therefore be debated. In any case, the observers in Cleveland believe that the existing organisation of the schools is sufficient to handle all the details without any additional organisation or expense.

Mason<sup>3</sup> discusses "mistakes in one hundred thyroidectomies." The series consists of fifty-eight persons operated upon for toxic

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adenomas with one death, and forty-two patients operated on for exophthalmic goitre with five deaths.

Toxic adenomas are held to produce a sequence of symptoms which differ from exophthalmic goitre.

There is usually no sudden exacerbation which commonly characterises exophthalmic goitre. Symptoms may not begin for years after the goitre is first noticed. There is then a gradually increasing chain of symptoms extending over years. The goitre usually begins in the teens or twenties. The onset of symptoms is much later. Six of the cases had substernal goitre with thyrotoxic and pressure symptoms, and this with other observations leads Mason to the belief that all substernal goitres are adenomatous, and sooner or later become toxic. Secondary operations were required in six cases because of recurring symptoms associated with enlargement of that portion of the thyroid left at the previous operation. Immediate improvement followed the first operation for a period averaging two years, thereafter the symptoms, within a few months, became nearly as severe as before the first operation. Rest and medical treatment preliminary to operation should be undertaken in bad cases to get the patient into reasonably good physical condition.

The operation can usually be performed under morphia and local anæsthesia. Patients sit up at the end of three days, and leave hospital at the end of the week provided the cardiac condition is good enough.

Mistakes were made in operating on severe cases without preliminary treatment and, on the other hand, cases were lost by refusing operation in extremely ill patients usually because of bad hearts. Latterly no case of toxic adenoma has been regarded as too ill to put at rest under observation with a view to thyroidectomy, and most cases can be tided over the operation. If thyroidectomy can be performed there is great improvement in the patient's general and cardiac condition. Recurrence of goitre and toxic symptoms seems to indicate that too little of the thyroid has been excised, and the present tendency is to increase the amount of thyroid removed.

In exophthalmic goitre the typical case shows a slight thyroid enlargement with mild toxic symptoms during several months. The symptoms usually increase gradually until about the eighth month, when they become much worse. During the ninth month there is usually an explosion of symptoms commonly known as a crisis. Then there is a period of improvement with fairly constant symptoms. At about the end of the second year a second crisis occurs, never quite so severe from the point of view of toxicity as the first. After this there are ups and downs until, after years, the toxicity of the goitre wears out, and there is occasionally a cure, but usually a human

## Goitre and Exophthalmic Goitre

wreck suffering from cardiac and general degenerations. Early in the disease it may be difficult to make a diagnosis of hyperthyroidism.

The rate of basal metabolism will be of great assistance at this period, because it assures the diagnosis and enables surgical interference to be urged at the time when most benefit can be secured. The heart, liver and kidneys have not been damaged, the operative risk is good and the end results are better than at any other time in the history of the disease. Unfortunately, if the patient is put at rest and given any medicine or none, there is a temporary improvement. This temporary improvement and the rapid improvement which follows the crisis have caused many drugs to be regarded as specific, and much valuable time has been lost to patients because this improvement has been credited to the medicine. Thus good surgical risks have been permitted to become poor ones. Should the patient be allowed to pass through the usual course of the disease, there is such a change in the vital organs that it is impossible by surgical means to secure more than a relative cure. The ideal time for operation is within the first six months. The closer the surgeon gets to the high wave of toxicity, the higher is the mortality and the larger the number of incomplete cures. The patient operated on before the crisis is eventually much better off than the one who is carried to and then through the crisis by medical treatment and operated on later. It must be remembered, however, that the patient who is operated upon early in the disease will have a slight wave of toxicity at the time of the first crisis, but the severity of the crisis will be reduced in proportion to the fraction of the gland removed. If four-fifths of the gland has been removed the subsequent crisis will be one-fifth as severe. In extremely toxic cases it is impossible to tell how much operative interference will be tolerated. As a rule the patient's history and general condition, the pulse and pulse pressure and the metabolic rate give an index to the severity of intoxication. The shock of acute exacerbation of symptoms, however, following operative procedure is not always as expected. In other words, we have no accurate way of determining the amount of damage already done, although findings regarding the present activity of the gland may be fairly accurate.

Post-operative results have been reported by three-quarters of the author's patients. They are all improved and most of them feel well. Two of them are cardiopaths and one suffers from degenerative changes. These cases exemplify the results which so often follow exclusive and persistent medical treatment. The hyperthyroidism has disappeared but the degeneration of vital organs persists. In five cases it has appeared necessary to perform secondary operations. In these five cases there were very severe



## Alexander Goodall

symptoms following thyroidectomy. This observation with other experience has led to the belief that there is less reaction if a very large portion of the gland is removed.

Lack of judgment as to the best time to operate has caused disappointment. The most serious mistakes have been due to the lack of a full appreciation of the dangers of the crisis of the disease and by attempting too much in extremely bad cases. While anxiously watching the first three days of a stormy convalescence, it has been wished that a less complicated operative procedure had been undertaken.

In operation on severe cases little general anæsthesia is used. In patients who are poor surgical risks, rest and medical treatment are employed until maximum improvement is attained and then injection of boiling water or ligature of one superior thyroid artery is depended on to ensure further improvement. Injection of boiling water may give an idea of the reaction of the patient but it destroys no portion of the gland. Ligature will often precipitate a severe attack of hyperthyroidism. There is almost always a reaction. This is especially true after ligature. The collateral circulation is restored within a few days and this leads to the belief that the improvement following it is largely due to an increasing immunity to the disease resulting from these high waves of toxicity. In bad cases it is believed that the safe removal of the gland with little reaction or pain can be attained by a method of fractional cauterisation. Lahey<sup>4</sup> is of opinion that too little attention has been paid to intrathoracic goitre which may be plainly diagnosed and successfully operated upon if its presence is recognised before its growth has reached proportions which threaten life by obstructing respiration or preclude removal because of its size. There are two classes of intrathoracic goitre. There is a type which cannot be palpated or can be only just touched in the episternal notch. This group is made up of adenomas or cysts of the thyroid.

Another class is incompletely intrathoracic. This is cystic, adenomatous or colloid. Colloid goitres in the chest often become calcified. It might be expected that all enlargements of the thyroid reaching any size would be directed downwards but the great majority extend forwards. The factors which determine downward growth are the pressure of the anterior group of neck muscles and the up and down movements in swallowing, which enable the gland to mould a bed for itself. A tumour of the thyroid may become completely intrathoracic if its axis diameter is below the level of the top of the thorax. The usual forward direction of an enlarged thyroid is explained by the gradual attenuation of the sternohyoid and sternothyroids and by the firm adherence to the trachea which prevents downward extension.

# Goitre and Exophthalmic Goitre

Early evidence of intrathoracic goitre is afforded by respiratory obstruction.

Several such cases have been treated for a long time for asthma. X-ray examination shows a substernal shadow and a distinct widening of the upper sternal shadow. A bending or deviation of the trachea is of great diagnostic importance.

On fluoroscopic examination, ascent and descent are of value in distinguishing thyroid tumour from other mediastinal growths which do not move. Any blurring of the capsule and any involvement of the inferior laryngeal nerve suggest malignancy. Percussion dulness is present in all intrathoracic goitres and intratracheal examination may reveal denting or bending of the trachea.

Claiborne<sup>5</sup> holds that exophthalmos is the first and basal sign of exophthalmic goitre. The great majority of the other signs follow this and are all explained by the mechanical factor. The first to appear is the showing of the sclera above and below the cornea when the eye is at rest (Dalrymple's sign). This is followed by the von Graefe, and later, by the Stellwag sign. The pupils are usually enlarged, especially in blondes, and trembling of the eyelids sometimes occur when the eyes are open.

Bulson<sup>6</sup> does not accept the mechanical explanation of the eye symptoms. Exophthalmos in his view is not a primary or constant symptom. If the exophthalmos were really due to venous congestion and increase of fat there should not be the variations which readily occur, and any oedema should spread to the eyelids. There is no evidence of stasis of the retina and no evidence of arterial congestion since there is no pulsation of the eye. The Dalrymple symptom is independent of the exophthalmos and none of the other symptoms are proportionate to the degree of exophthalmos. The view that a disturbance of the sympathetic system is responsible for all the signs of exophthalmic goitre, and that the thyrotoxin acts selectively on the sympathetic has not been disproved.

It may be pointed out that arterial pulsation in the eye in exophthalmic goitre has been reported.

REFERENCES.—<sup>1</sup> *Journ. Amer. Med. Assoc.*, 4th September 1920. <sup>2</sup> Marine and Kimball, *Archiv. Inter. Med.*, June 1920. <sup>3</sup> Mason, *Journ. Amer. Med. Assoc.*, 17th July 1920. <sup>4</sup> Lahey, *ibid.* <sup>5</sup> Claiborne, *ibid.* <sup>6</sup> Bulson, *ibid.*

## NOTES

### Appointments—

Professor Sir ROBERT PHILIP has been elected as the first President of the International Society for combating Tuberculosis.

At a Meeting of the Royal College of Surgeons of Edinburgh held on 20th October, Dr GEORGE MACKAY, 26 Drumsheugh Gardens, Edinburgh, was re-elected President, Dr R. M'KENZIE JOHNSTON, 2 Drumsheugh Gardens, Edinburgh, Vice-President, and Mr ALEXANDER MILES, 20 Walker Street, Edinburgh, Secretary and Treasurer.

Dr ARTHUR H. H. SINCLAIR has been appointed an Ophthalmic Surgeon to the Royal Infirmary; and Dr E. H. CAMERON has been appointed an Assistant Ophthalmic Surgeon.

### Fellowship Examination—

At a meeting of the Royal College of Surgeons of Edinburgh held on 20th October, the following, having passed the requisite examinations, were admitted Fellows:—

Ewart G. Anderson, M.R.C.S. (Eng.), M.B., B.S. (Durham); W. B. C. Angus, M.R.C.S. (Eng.), M.B., M.D. (Cantab.); Stanley Batchelor, M.R.C.S. (Eng.), M.B., B.S. (Univ., Lond.); Andrew James Caird, M.B., Ch.B. (Edin.); Clement L. Chapman, D.S.O., M.B., Ch.M. (Sydney); Graham Wilson Christie, M.B., Ch.B. (Edin.); Barry K. T. Collins, M.R.C.S. (Eng.); William F. Currie, M.B., Ch.B. (New Zeal.); J. K. Datta, M.B. (Univ., Calc.), M.R.C.S. (Eng.); Norman H. Dempster, M.B., Ch.B. (New Zeal.); H. M. Desai, L.M. & S. (Bombay); James L. Diggle, M.B., B.S. (Melb.); Oswald Ellis, M.B., Ch.M. (Sydney); Dallas S. Falconer, M.B., Ch.B. (Edin.); Kenneth G. Fraser, L.R.C.S.E.; Aubrey Goodwin, M.B., B.S. (Lond.), M.R.C.S. (Eng.); Ernest A. Guymmer, M.B., B.S. (Adelaide); Alice Mabel Headwards, L.A.H. (Dub.), L.R.F.P. & S. (Glasg.); James M'A. Holmes, M.B., B.Ch., B.A.O. (Royal Univ., Irel.); Archibald M. Jones, M.B., Ch.B., M.D. (Edin.); James T. Kyle, M.B., B.Ch., B.A.O. (Queen's Univ., Belf.); John H. Lechler, M.B., Ch.B. (Edin.); James Lyons, M.B., B.Ch., B.A.O. (Queen's Univ., Belf.), M.D., D.P.H. (Trinity Coll., Dublin); Donald M'Intyre, M.B., Ch.B. (Glasg.); Daniel M'Vicker, M.C., M.B., Ch.B. (Edin.); Henry H. M'Williams, L.R.C.S.E.; George E. Martin, M.B., Ch.B. (Edin.); Thomas A. Milroy, M.R.C.S. (Eng.); Alexander R. Moodie, M.B., Ch.B., M.D. (St And.); William Morris, M.R.C.S. (Eng.); Kenneth D. Panton, M.B. (Univ., Toronto), M.R.C.S. (Eng.); William C. Paton, M.B., Ch.B. (Edin.); Robert Richards, M.B., Ch.B., D.P.H., M.D. (Aberd.); George Richardson, M.B., Ch.B., M.D. (Edin.), D.P.H.; John Sutherland Taylor, M.B., Ch.B. (Edin.); James Hall Tennent, M.B., Ch.B. (Edin.); Benjamin Thomas, M.R.C.S. (Eng.), M.B., B.S. (Univ., Lond.); William A. Thompson, M.B., B.Ch., M.Ch. (Queen's Univ., Belf.); Cecil H. Vernon, M.B., B.Ch. (Cantab.); David G. Wishart, M.B., Ch.B. (Edin.); Max Yuille, M.B., Ch.B. (Univ., Melb.).



## Notes

### Diploma in Public Health—

At the recent Examination of the Board of the Royal College of Physicians of Edinburgh, Royal College of Surgeons of Edinburgh, and Royal Faculty of Physicians and Surgeons of Glasgow, the following candidates, having passed the First and Second Examinations, were admitted Diplomates in Public Health :—

Lloyd Huntly Werden, M.B., Ch.B. (Edin.); Joseph Chalmers, M.B., Ch.B. (Glasg.); Ronald Thomson Grant, M.B., Ch.B. (Glasg.); John Young, L.R.C.P. & S.E., etc.; Alfred Vincent Dill, M.B., Ch.B.; Frederick John Carlyle Johnstone, M.B., Ch.B. (Edin.); Allan Witherspoon, M.B., Ch.B. (Edin.); John James Rouse Binnie, M.B., Ch.B. (Edin.); Arthur Kinsey Towers, L.R.C.P. & S.E., etc., M.B., Ch.B. (Edin.); Dugald Ferguson, M.B., Ch.B. (Glasg.); Frederick John Kirkness, M.B., Ch.B. (Edin.); Margaret M'Naughton M'Garrity, M.B., Ch.B. (Edin.); George Maxwell Elliott, M.B., Ch.B. (Edin.); George Clazy M'Ewan, M.B., Ch.B. (Edin.); James M'Intyre, M.B., Ch.B. (Edin.); George James Linklater, M.B., Ch.B. (Edin.); Gladys Annie Adeline Boyd, M.B., Ch.B. (Edin.); John Fearby Campbell Haslam, M.B., Ch.B.; George Nicholson, M.D.; William Semple Wallace, M.B., Ch.B. (Glasg.); David Leishman Baxter, M.B., Ch.B.; Rosanna Elizabeth MacMillan, M.B., Ch.B.; Elizabeth Harper, M.B., Ch.B.; Edmund Brodie Munro, M.B., Ch.B.; Thomas Douglas Inch, M.B., Ch.B.; Ian Charles Mackenzie, L.R.C.P. & S.E., etc.; Alexander Patrick Gordon Lorimer, M.B., Ch.B. (Edin.); Francis Gregory Foster, M.B., Ch.B.

### Triple Qualification Passes—

At the Examinations of the Board of the Royal College of Physicians of Edinburgh, Royal College of Surgeons of Edinburgh, and Royal Faculty of Physicians and Surgeons of Glasgow, the following candidates passed the *First Examination*:—D. M. Safwat, H. J. Marcelin, R. H. MacKintosh, W. D. Howat, R. D. Scorgie, A. Raff, E. N. Jamieson, D. L. Crawford, and W. Mason. *Second Examination*.—P. A. M. Jayewardene, J. M. M'Kendrick, P. Murray, H. W. Amyes, T. E. Mathias, B. F. Home, A. Adefolu, O. ap V. Jones, and A. H. Kretchmar. *Third Examination*.—W. C. Rodrigo, J. M. M'Innes, D. J. Dubash, D. R. Cilliers, F. Walwyn, P. E. Malloch, J. H. Dobbin, and Marguerite M. I. Swanson. The following candidates having passed the *Final Examination* were admitted, L.R.C.P.E., L.R.C.S.E., L.R.F.P. & S.G.—Sylvia Ethel Aldous, Ceylon; Wells Allen Ruble, United States; John Pringle Crichton, Perth; Cedric Holmes, Stockton-on-Tees; William Wolfe Glucksman, South Africa; Austin Furniss, Manchester; William Frederick George Radford, Edinburgh; Hendrik Jacobus Louw, South Africa; Kathleen Eleanor Hyde Rutherford, Glasgow; Chepad Sangar Govinda Pillai, India; Veeravagu Kathiravelu Paramanayagam, Ceylon; Dorothy Mary M'Cullagh, Belfast; Andrew Wood Smith, Biggar; and Donald Mackay, Argyleshire.

## NEW BOOKS

*Essays on Surgery of the Temporal Bone.* By Sir CHARLES A. BALLANCE, K.C.M.G., C.B., M.V.O., M.S., F.R.C.S. Two Volumes. Pp. 604, with 125 plates and 120 figures. London: Macmillan & Co. 1919. Price £5, 5s.

During the last twenty-five years Sir Charles Ballance has written numerous papers on the grave complications of aural disease and the major operations of aural surgery; these papers, re-written and expanded, are the foundation of this book. The author states that the work was ready for publication shortly before the outbreak of the war, and one cannot help regretting that it was not brought out at that time. As publication could not take place in 1914 it would have been better to delay still further, so that the work might represent more accurately the present state of otology. The section on Anatomy, for example, appears to have been written about 1908, and otology has made great advances since then — especially as regards our knowledge of the labyrinth. Reference should certainly be made to the importance of radiograms of the temporal bone.

The various chapters take the form of essays, each being headed by one or more selections of poetry and prefaced by a lengthy historical survey, much of which is interesting, though this feature is considerably overdone. The first two chapters are entirely concerned with historical observations. Dr Charles D. Green has been responsible for searching the literature of each subject, but it cannot be said that he has brought the various sections up to date. Further, the book partakes largely of the character of a compilation, and would have been better had it contained more of the author's own experiences. No one can deny that otology owes an enormous debt to the work of German and Austrian surgeons, and the author by his extracts has generously acknowledged this. On the other hand the work done in Anglo-Saxon countries has hardly received the attention it deserves.

One great advantage of this book is that the writer is a general surgeon as well as an otologist, and is able to bring his general surgical experience of the treatment of suppurative conditions to bear on his remarks regarding the complications of middle ear disease. His analogies in many cases are very apt.

The fact that the work is composed of old essays reprinted leads to considerable redundancy; *e.g.*, tuberculous otitis media is dealt with in the section on Pathology and again in those on Acute

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and on Chronic Otitis Media. It would have been better had there been a separate chapter on this subject.

Chapter III. deals with Anatomy. In a work published in 1919 the statement should not be made that a sclerotic mastoid process is usually the result of deep-seated inflammation without giving Cheate's teaching on this subject (page 60). The section on Pathology is good. Ballance supports the view that cholesteatoma is an ingrowth of squamous epithelium from the meatus.

In the chapter dealing with Acute Otitis Media, contrary to modern experience the author states that in this condition fever is usually present. Paracentesis, or, as the author prefers to call it, "incision of the drumhead," is well treated. Ballance is guarded in his recommendation of the blood-clot method of healing after the Schwartze operation, and records one case in which this method was followed by a fatal result. At the end of this chapter there are numerous illustrative cases.

In the chapter on Chronic Purulent Otitis Media, the author points out that chronic middle-ear suppuration is always the result of a preceding acute otitis. No acute case should be allowed to become chronic. Most of the chronic cases follow one of the acute infective diseases, and, in the majority, the preceding acute otitis has not been treated. So long as otorrhœa is present we can never tell where or when it will end or what it will lead to. Sound views are expressed on the indication for the radical mastoid operation. Though Ballance does not claim to have been the first to introduce skin-grafting, great credit is due to him and to Mr Marriage for their work on this subject. The author's opinion in regard to the modified radical, often known as the "Heath" operation, in chronic cases is as follows:—"To attempt to cure cases of chronic otorrhœa without removing the 'bridge' is to act in opposition to the fundamental principles of surgery." Ballance is rather sketchy on the treatment of the Eustachian tube during the radical mastoid operation; failure to close the tube is a common cause of persistent otorrhœa.

Chapter VII. deals with the Labyrinth, and gives a good account of Ewald's historical experiments on the examination of the vestibular apparatus. There is, however, no mention of the pointing test. The views of various operators are given as to the indications for, and the methods of performing, the labyrinth operation. Little is said about labyrinth fistula and circumscribed labyrinthitis, but there are some personal experiences on division of the eighth nerve by the cerebellar route, and an interesting suggestion for restoring hearing by making an artificial opening in the bony wall of the cochlea and covering it with a skin graft.

The chapters dealing with the Pathology and Symptoms of the



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Intracranial Complications begin with the usual historical survey, but many of the case records are ancient. The histories of such cases are much better given in recent times. Some of the illustrations are excellent.

In discussing the treatment of the intracranial complications, Ballance rightly states that the ideal treatment is preventive. The fate of most of these cases lies in the hands of the general practitioner, who should lose no time in seeking such aid as may be necessary. In dealing with brain abscess, the author holds that the finger is the best and only suitable probe. As regards drainage, he advocates rubber tubes, and holds that irrigation of the abscess cavity is not advisable. He believes that otitic venous infection need not always be preceded by thrombosis, and holds that the statements that operation on the jugular vein in cases of sinus thrombosis is *never* required, and that it is *always* required, are equally erroneous. Exploration of the sigmoid sinus by means of a hollow needle is entirely futile. If the surgeon considers it essential to ascertain what is inside the sinus he must open it and see. A valuable feature of this chapter is the inclusion of illustrative cases, especially of fatal ones.

The chapter on Injuries of the Ear contains accounts of original cases and of others collected from the literature. This section, however, does not include the experiences gained in the recent war. Ballance appears to favour early operation in cases of fracture of the base involving the middle ear.

The description of the Operative Treatment of Facial Palsy is particularly good. It enters fully into regeneration of nerves after injury and contains much personal experience.

The work is well and clearly written and should be accessible to every otologist, as it is a mine of information. It is well printed on good paper, and as a rule the photographs and plates are excellent. Many of the illustrations, however, are very old, and some of them are accompanied by little or no clinical history.

*A Manual of War Surgery.* By Colonel SEYMOUR BARLING and Major JOHN T. MORRISON. Pp. 479, illustrated. London: Henry Frowde and Hodder & Stoughton. 1919. Price 21s. net.

The question as to how far the advances made in war surgery during the late war will influence civil surgery in the immediate future is one of general interest. This admirable manual indicates in how many different branches of surgery new methods have been developed which will remain as permanent advances in general surgery. The late appearance of this war manual should not restrict its circulation,

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as all who are interested in surgical work will find in it valuable information in regard to all types of casualty surgery. The sections on the physiology and pathology of war wounds by Captain E. F. Bashford, and on the principles of wound treatment by Major J. T. Morrison, will well repay perusal. They show clearly how considerable is the resistance of healthy vital tissues to infection, and how important is the revival of all devitalised tissue which may act as a breeding-ground for bacteria. The desirability of immediate or of secondary closure of wounds is firmly established, and the frequency of re-infection of open wounds from the surrounding skin unless careful precautions are taken is emphasised. Of the special sections, those dealing with wounds of the chest by Colonel Barling and Major Sevestre, with wounds of the bones by Captains Hartley, Shore, and Le Mesurier, with wounds of the joints by Colonel Forbes Fraser, and with wounds of the face and jaws by Major Kazanjain, are of particular interest, for they deal with regions where the greatest advances have been made. The freedom with which the lung can be exposed and handled, and the necessity for thorough cleansing and the removal of foreign material and devitalised tissue in thoracic as in other wounds, are illustrated.

The section dealing with wounds of the bones is both exhaustive and concise. The many valuable methods which were either introduced or elaborated and perfected during the war, and particularly in the course of the latter two years, are described by writers who themselves took a very active part in this important development of surgical practice.

This book can be very cordially recommended to all who are interested not only in military but in civil surgery, and who desire to incorporate in their work the many valuable surgical lessons of the war.

*The Sympathetic Nervous System in Disease.* By W. LANGDON BROWN.

Pp. viii. + 161, with 9 illustrations. London: Henry Frowde and Hodder & Stoughton. 1920. Price 10s. 6d. net.

In this work, based on the Croonian Lectures which he delivered in 1918, the author sketches, in the first place, the main plan on which the autonomic nervous system is arranged. This he does briefly and clearly, if only in outline, but the practitioner will probably find that outline sufficient for his purposes.

The action on the sympathetic system of the secretions of the adrenal, pituitary, and thyroid glands is fully described in each case, and the question of the various ways in which glycosuria may arise receives elaborate and thoughtful discussion. The author considers that this condition, if persistent, may be due either to over-action of the adrenal, pituitary, or thyroid glands, or to under-action of the

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pancreas; and further, that in such cases there may or there may not be structural changes in these glands. The bearing of such considerations on the treatment of diabetes is indicated in some detail.

In connection with the disorders of digestion, the author points out the importance of the influence of the autonomic system. He indicates that Lane's kinks are in many cases not purely mechanical, but are produced in reality by spasm of the sphincters, together with inhibitory relaxation of the intestinal wall, both of these being the result of over-action of the sympathetic.

The book is well and clearly written. Its arguments are logical, are founded on accurate physiological data, and are correspondingly convincing. It is well worth the attention of the busy practitioner.

*The Mechanism and Graphic Registration of the Heart-Beat.* By THOMAS LEWIS. Pp. xx. + 452, with 349 illustrations. London: Shaw & Sons, 1920. Price £2, 7s. 6d. net.

This book is essentially a second, enlarged, and vastly improved edition of the author's monograph, *The Mechanism of the Heart-Beat*, published nine years ago. The character and scope of the book remain unchanged. The reader must not expect to find any presentation of clinical cardiology in the usual acceptance of the term. The experimental pathologist has little sympathy with the ordinary methods of investigation which are essential to the practice of clinical medicine. To the author, clinical tests, "the expedients and opportunisms of the bedside worker," are but means to "litter and obstruct the path of knowledge." While the scope of the book is therefore limited to one branch of cardiology, this is dealt with very thoroughly. The text is mainly an epitome of the author's numerous original papers.

The first part is devoted to the anatomy and histology of the nodes and junctional tissues, and to physiological principles, including an account of the normal pacemaker of the mammalian heart, the spread of the excitation wave, the meaning of the electrocardiographic deflections, and their alterations associated with preponderance of one or other ventricle. The second part presents a philosophic discussion regarding the analysis of disorders of the cardiac mechanism as revealed in arterial, venous, and electrocardiographic curves. The outstanding features of the book are the wealth of experimental research it summarises, the constant correlation between experimental and clinical records, and the identification of cardiac disorders observed clinically with those induced experimentally in the lower animals. In these respects the book will prove of the utmost value to physicians and experimental pathologists who are seeking to unravel the nature of cardiac arrhythmias.

There is much new matter in the text, which has been brought



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fully up to date, especially in the chapters dealing with the interpretation of ventricular deflections, extra systoles, flutter, and ventricular fibrillation. Flutter is regarded as consisting probably of a simple "circus movement," in which the contraction-wave travels continuously through the wall of the auricles because the refractory period becomes somewhat shorter than the total duration of spread of the excitation process. Auricular fibrillation is held to be due, not to the excitation of many centres, but to depressed conduction in the auricular wall. This hypothesis, which is not new, is in keeping with clinical facts.

There are many explanatory footnotes, some of which are of sufficient importance to have justified their inclusion in the text. The extensive bibliography and author index reveal a remarkable output of experimental research, particularly in the United States, during the years 1914-1918. Of the 349 illustrations, all of which are admirably clear and well reproduced, a large number are new. Those presenting simultaneous records of the arterial, venous, and electrocardiographic curves are particularly good.

*Common Infections of the Kidneys with the Colon Bacillus and Allied Bacteria.* By FRANK KIDD, M.B., B.C. (Cantab), F.R.C.S. Eng. Pp. xx + 331, with 21 illustrations. London: Henry Frowde and Hodder & Stoughton. 1920. Price 18s. net.

This book is collated by Mr Kidd from facts observed in cases that have been under his personal care. A short summary of these cases is given at the end of the book and provide a convenient reference on any of the points on which further information may be desired. The book is written in a style that is eminently controversial and correspondingly fascinating. The thesis on which it may be said to be based is that the human body is, according to Mr Kidd's conception, a bacterial sponge. The majority of the bacteria are in no way harmful but really beneficial to their host, but in certain circumstances, especially when the power of resistance of the body to infection is lowered, they may be harmful agents. The entrance of micro-organisms into the blood stream is, according to Kidd, an incident of frequent occurrence. They are excreted from the circulation by the kidneys, through which they may pass undetected, unsuspected, and without producing damage. When, however, they do produce disease, pyelitis results, acute or chronic in nature. The frequency with which acute pyelitis is mistaken for some other disease is emphasised, as is the curative effect in such cases of the alkalinising treatment. The principle that he aims at is at once to wash the patient's tissues freely with water and alkalies. He advocates the administration of potassium citrate given freely till the urine is alkaline. The fulminating type of pyelitis Kidd also treats with

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alkalies, but he wisely points out that in such cases there is undoubtedly a type in which an experienced surgeon can see at a glance that nephrectomy is the only hope. In chronic pyelitis he recognises that, in cases which fail to be cured within three months by a general line of treatment directed to correct the underlying cause, resort should be had to renal lavage.

This book is to be strongly recommended to those who desire a clear and logical exposition of certain common infections of the kidney, given by a surgeon of wide experience and clear judgment. No one will agree with all he says, but everyone will benefit by much that he says.

*Studies in Neurology.* By HENRY HEAD. 2 Vols. Pp. 862, illustrated. Oxford Medical Publications. London: Henry Frowde and Hodder & Stoughton. 1920. Price £3, 3s. net per set.

These volumes consist chiefly of a reprint of the well-known series of papers dealing with the problem of sensory innervation contributed by Head and a number of collaborators to the pages of *Brain* between 1905 and 1918. On their first publication, the earlier papers, describing the phenomena of peripheral sensation, were recognised as opening up a new chapter in clinical neurology, and subsequent work along the same lines has confirmed the general applicability of Head's "new hypothesis." Since 1905 many of the fundamental conceptions then elaborated for the first time have become almost axiomatic—e.g., the distinction between protopathic, epicritic, and deep sensibility. The later papers pursue the investigation into the spinal cord and brain-stem, and treat in an exhaustive way of the relations between cerebral lesions and the sensory disorders arising therefrom. In all seven papers, each dealing with a different aspect of the functions of the sensory nervous system, are here assembled, and the collection forms a most impressive contribution to modern medical science.

Besides forming a permanent record of a fine piece of work, these volumes will make a wider appeal as an example of how any such problem ought to be investigated. *A priori* hypotheses are abandoned; large numbers of cases are examined and minutely described; objective criteria are applied as widely as possible; and every generalisation is formulated with due regard to the scope of the observations which support it. It is, of course, impossible to eliminate entirely the personal factor in testing sensory phenomena, but conditions as near perfection as possible were surely achieved in at least one of the experiments here recorded. For the express purpose of observing the changes due to section and repair of cutaneous

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sensory nerves, Head had the radial and external cutaneous nerves of his left arm cut, and the resulting paper—"An Experiment in Human Nerve Division"—is a unique piece of work.

The work is prefaced by an excellent chapter on the methods of examining sensation, and the equally important matter of the clinical application of these methods. The volumes do credit to the publishers, and special commendation is due to them for the unvarying excellence of the numerous illustrations.

*The Nation's Food: A Statistical Study of a Physiological and Social Problem.* By RAYMOND PEARL, Ph.D., Sc.D., LL.D. Pp. 274, with 42 illustrations. Philadelphia and London: W. B. Saunders Company. 1920. Price 16s. net.

From the author's position as chief of the Statistical Division of the U.S. Food Administration from 1917-1919, and as Professor of Vital Statistics at Johns Hopkins, it is obvious that he had exceptional advantages in attacking this enormous subject. And although he modestly disclaims having done more than bring together a mass of carefully made bricks for the various specialists in agriculture, physiology, economics, and sociology (and admittedly he has done all that), the book is a pioneer work of a most important subject.

The war brought home to all nations, whether engaged in it or not, the importance of the question of food supply, actual and potential, at home and abroad, friendly and hostile; and no nation found itself in a position to give an answer. Here for the first time the material is available for a statistical survey of the food resources and the food demands of the United States.

The basis of the survey is naturally and necessarily physiological, not trade or commerce. The questions are—how much protein, fat, and carbohydrate is produced annually as used or usable human food? how much of these are exported and imported? what is the actual annual consumption? and what is the distribution of imports among the various classes of food?

After a detailed survey of the primary and secondary food production, in which the carefully arrayed data are accompanied by skilfully prepared diagrams, the total production is taken up. It is interesting to find that the latter increased steadily to a maximum in 1915-16, then fell off in the next two years; also that the average increase during the four war years was 10 to 12 per cent. over the three pre-war years.

It is impossible to point all the morals, but certain conclusions are of especial interest. Thus 53 per cent. of the protein comes from secondary foods, *i.e.* animal sources, and for fats the figure is 82 per cent.; further, there was little change during the seven



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years. (The corresponding British figures are 42 and 92 per cent.). In the final calculation of the food consumption per adult man per day, the following significant results are obtained—protein, 120 g.; fat, 169 g.; carbohydrate, 541 g.; and calories, 4288. The important factor of loss in cooking and avoidable waste of edible material is estimated to be—protein, 5 per cent.; carbohydrate, 20 per cent.; fat, at least 25 per cent.; and when these are applied to the above daily ration, the figures become 114 g., 127 g., 433 g., and 3424 calories.

The arrangement of the bewildering mass of data, the clear and numerous diagrams which alone enable one to grasp their significance and show the direction in which things were moving, and the production of the work, cannot be too highly praised.

*The Medical Aspects of Mustard Gas Poisoning.* By ALFRED SCOTT WARTHIN, Ph.D., M.D., and CARL VERNON WELLER, M.S., M.D. Pp. 267, with 156 original illustrations. London: Henry Kimpton. 1919. Price 42s. net.

The introduction of poisonous gases as an offensive in war-time necessitated an immediate investigation of these substances. The problem presented so many sides that it was quite apparent that the quickest and most accurate results would be obtained by co-ordinated work. The present volume is an excellent example of this method of investigation. It is comprehensive of the action and lesions of dichlorethylsulphide, commonly known as mustard gas. The matter is dealt with in detail according to the principal systems involved, and the various lesions have been investigated both from the experimental and clinical points of view. There are also chapters on general pathology and clinical pathology and treatment of this condition. The value of the text is greatly enhanced by the excellent and numerous photographs and photomicrographs, while the bibliography of the subject is very complete.

*The Diseases of Infants and Children.* By J. P. CROZER GRIFFITH, M.D., Ph.D. Vol. I., pp. 885; Vol. II., pp. viii. + 657, with 436 illustrations, including 20 coloured plates. Philadelphia and London: W. B. Saunders Company. 1919. Price 72s. net.

Professor Crozer Griffith writes this book from the experience of almost forty years as medical practitioner, hospital physician, and teacher in pediatrics. He is already well known on both sides of the Atlantic as an industrious and valuable contributor to current medical literature, and as the author of *The Care of the Baby*, a manual for mothers and nurses, which has had a very large sale in

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America. But in these two large volumes he has now for the first time garnered the complete rich harvest of his long experience of practice and teaching in pediatrics. And it may be said at once that the book is worthy of the high reputation of the author and of American pediatric science. The whole wide field of diseases of children is covered, even such infectious diseases as measles, scarlet fever, smallpox, chickenpox, etc., which are usually reserved for special text-books, being thoroughly dealt with. The first division of the subject-matter deals with the special anatomy and physiology of child-life, hygiene, breast and artificial feeding, foods and food-values, and gives an unusually clear and authoritative account of this difficult and complicated subject. In perusing these pages the reader can feel, no doubt, that he is receiving the results of first-hand and intimate experience. The author next deals with the diseases of the newly-born, with infectious diseases, with general and nutritional diseases including rickets and scurvy; and then proceeds with the diseases of the various systems. The volumes are very richly illustrated with temperature charts and photographs, and to most of these are appended brief case-records. These numerous case-synopses are in themselves a valuable part of the book, and give point and interest to the diseases which they illustrate. The author's acquaintance with the European and American literature on his subject is also attested by the great number of references included in the text. Here indeed one feels that the writer almost overloads his pages, and loses clearness and compactness in aiming at thoroughness. It must not be thought, however, that the book is an encyclopedia. Some of the subjects are very briefly dealt with. The large subject of imbecility and mental defect in childhood is compressed into a few pages, and receives a scarcely adequate treatment; while under rickets and scurvy recent important work upon vitamins is merely glanced at. But as a whole, and as the work of one man, the book is a very notable performance; and it immediately takes place in the first rank of text-books on this subject in the English-speaking world.

*An Atlas of the Primary and Cutaneous Lesions of Acquired Syphilis in the Male.* By Major CHARLES F. WHITE and Dr W. HERBERT BROWN. Pp. vii + 32, with 83 illustrations. London: John Bale, Sons & Danielsson, Ltd. 1920. Price 27s. 6d. net.

As Lieut.-General Goodwin points out in his foreword, "There is probably no other disease in which early detection and consequent early treatment are of more paramount importance" than in Syphilis. The authors have succeeded admirably in giving the student and practitioner helpful aid to diagnosis in the excellent series of photographs which they have collected from the large amount of clinical

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material which passed through their hands. The color work is consistently good, and the photographs as viewed through the stereoscope give one a life-like picture of the lesions which falls little short of actual observation. The supplementary notes are short, concise, and to the point, and bear the stamp of accurate observation and attention to detail.

Although primarily an Atlas, the value of the work is enhanced by the text, especially of Parts I., II., and III., in which the authors discuss very thoroughly the clinical characteristics of Syphilitic Chancres and Soft Sores, and apportion the true weight which one may attach to the various signs and symptoms. The value of combining clinical observation and clinical pathology is emphasised, and the advice given in Part III. to "Be very certain of your diagnosis before telling a patient that he suffers from Soft Sores only" is a word of warning which cannot be too often repeated and emphasised.

The whole work is characterised throughout by thoroughness, and the authors have succeeded in giving to the profession a work which contains the essentials to enable the student and the inexperienced practitioner to establish an accurate and early diagnosis, and provides the expert with a remarkably complete and accurate record of the primary and cutaneous lesions of syphilis. The authors are to be congratulated on the success of their work.

*Malaria at Home and Abroad.* By S. P. JAMES, M.D., D.P.H. (Lieut.-Col. I.M.S., retired). Pp. xi+234, with 1 map and 104 illustrations. London: John Bale, Sons & Danielsson, Ltd. 1920. Price 25s.

This is a helpful summary of the present state of our knowledge of the malaria problem. A brief description of the three specific pathogenic agents is followed by an account of the characters and life-history of mosquitoes, and keys are given to the species of *Anopheles* recorded from the principal geographical areas. In discussing the habits of mosquitoes, the author emphasises the importance of "malarious houses." The explanation of these seems to be that a mosquito, which has lived long enough to become infective, has remained for some weeks in such a house or has returned to it after every flight. This appears to be particularly the case in regard to *Anopheles maculipennis* in England, and the evidence derived from a study of several instances is clearly set forth. The important factor in the malaria problem in Britain is the degree to which there is close and continuous association between malaria carrier, *Anopheles*, and susceptible persons, and the requisite degree of continuous association occurs in those houses which *Anopheles maculipennis* has selected as its resting-place. Evidence is adduced



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to show that in Kent there remain a few areas where endemic malaria still persists. Col. James deals admirably with the problems presented by a malaria survey in this country and in the tropics, and with measures of defence—use of quinine, screening, segregation of the healthy—and of attack—destruction of mosquitoes, discovery and treatment of all human cases and carriers, especially native children.

*War Against Tropical Disease.* By ANDREW BALFOUR, C.B., C.M.G., M.D. Pp. 220, with 180 illustrations and 2 graphs. Published for the Wellcome Bureau of Scientific Research by Baillière, Tindall & Cox, London. 1920. Price 12s. 6d. net.

Of these seven lectures or sermons the first six have already appeared, but they have been brought up to date by the addition of notes. The sermons proclaim, in Dr Balfour's vigorous style and with numerous apt references, the pre-eminent value of a study of hygiene and related factors in the war against tropical disease. The heads of the seven sermons are respectively (1) some aspects of tropical sanitation, with special reference to Khartoum where Dr Balfour carried out notable pioneer work; (2) tropical problems in the New World; (3) preventive inoculation against typhoid and cholera; (4) the medical entomology of Salonika; (5) sanitary and insanitary make-shifts in the eastern war-areas, based upon the author's observations in Egypt, Salonika, Mesopotamia, Palestine, and elsewhere; (6) the problem of hygiene in Egypt—the three chapters of this sermon contain the substance of the three Chadwick lectures for the year 1919, and in the last of these Dr Balfour comments on the chief findings of the Commission, of which he was President, appointed to inquire into the future organisation and work of the Public Health Department, and he appeals for a speedy realisation by this country of its responsibilities so that there may be vigorous attack upon the forces of disease which hold in thrall "the gateway to the East"; (7) the palm from a sanitary standpoint.

*The Radiography of the Chest.* Vol. I. Pulmonary Tuberculosis. By WALKER OVEREND, M.A., M.D., B.Sc. Pp. 119, with 108 illustrations. London: William Heinemann, Ltd. 1920. Price 17s. 6d. net.

This book will be welcomed as a valuable contribution to a subject in which the diagnosis is greatly enhanced by radiography. The author briefly describes the general principles of X-ray technique necessary to chest work, and then proceeds to enumerate the types of pulmonary tuberculosis, and gives records of a number of instructive cases. He does so with a courage of his convictions to a degree rare in writers of text-books, and though somewhat dogmatic in his

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assertions, his statements are supported by an extensive and intimate knowledge of a complex subject. The style is clear and forcible and most of the reproductions are excellent. The volume can be heartily recommended to radiologist and physician alike seeking the correct interpretation of pulmonary opacities.

*Atlas for Electro-Diagnosis and Therapeutics.* By F. MIRAMOND DE LAROQUETTE, M.D., and translated by the late Miss Mary Gregson Cheetham. London: Baillière, Tindall & Cox. 1920. Pp. xvi. and 180, with 69 plates and figures. Price 15s. net.

It would be difficult to find a more compact yet comprehensive review of the subject this little book deals with. The method of procedure for arriving at a correct electro-diagnosis of the peripheral motor nerve system is given in a clear, terse, and concise manner. The chief feature of this publication is a series of very helpful anatomical plates, some of which are from radiographs of the living.

*The Mental Hygiene of Childhood.* By WILLIAM A. WHITE. Pp. xvi. + 193. London: William Heinemann. 1919. Price 6s. net. (Mind and Health Series).

This is a small book containing an account of the psychology of childhood from the Freudian standpoint. It is not badly done, and is quite free from offence, but it suffers from the same disability as do most attempts to reduce Freud's teaching to a popular form. The difficulty is, as it seems to the reviewer, that while to one already conversant with modern psychology the statements are largely acceptable and comprehensible, it is very doubtful whether any one approaching the subject for the first time could intelligently accept the views here brought forward, and still less could he apply them to the upbringing of children. There is, especially in the earlier chapters, a great deal of platitude, and there is not much practical application of the doctrines taught.

## NEW EDITIONS

*Leitfaden der Kinderheilkunde.* By Dr WALTER BIRK. Fourth Edition. Pp. xii. + 269. Bonn: A. Marcus & E. Webers Verlag. 1920. Price 15 m.

On the appearance in 1913 of the first edition of Birk's *Kinderheilkunde* it was favourably reviewed in this column, and the good impression then created is confirmed by the fourth edition. The present volume is the first part only of a complete work on pædiatrics and covers the field of diseases of infancy. Nutritional and developmental disorders come in for a large share of attention, and the chapters on infant feeding are well done. The book can be safely recommended as a useful introduction to the subject.

*Essentials of Human Physiology.* By D. NOËL PATON, M.D. Fifth Edition. Pp. xix. + 679. Edinburgh: W. Green & Son, Ltd. 1920. Price 25s. net.

Professor Paton's *Physiology* has so firmly and deservedly established its reputation as a students' textbook, that it is scarcely necessary to do more than announce the appearance of the fifth edition. It has been thoroughly revised in the light of the ever advancing science of physiology, and yet retains what has always been an attraction—the emphasis laid on the bearings of that science on disease and disease processes. For this reason it is *par excellence* a manual for the medical student. Almost the only criticism that suggests itself is that Head's work on sensation is discussed rather more briefly than its importance deserves. The Table of Contents is unusually complete, and there is a copious index.



## NOTES ON BOOKS

Dr G. A. H. Barton has written *Backwaters of Lethe* (H. K. Lewis & Co., 5s. net) to offer "some anæsthetic notions to commencing and occasional anæsthetists." Such readers should gather many and valuable practical hints, and even the specialist will read the book with interest and profit.

*A Treatise on Materia Medica and Therapeutics*, by the late Rakhalidas Ghosh, now appears in its eighth edition, edited by Lt.-Col. B. H. Deare, I.M.S., and Birendra Nath Ghosh, F.R.F.P.S. (Glas.). (Calcutta: Hilton & Co.) The student who wishes to understand and to remember the important facts bearing upon the use of drugs in the treatment of disease will gain little assistance from works on materia medica which are overloaded with details. There is little or no discrimination in this volume of 700 pages between useless and useful facts, and we can understand and sympathise with the dislike for the subject which such a method of treating materia medica must inevitably produce. Sixty per cent. of the information might be omitted with advantage. It perpetuates a bad method of teaching.

*Pharmacology*, by Douglas Cow, M.D. (J. & A. Churchill), is said by the author not to encourage "cramming," but we fear that he has encouraged the very evil he so rightly condemns. If a student wishes to revise his knowledge of hypnotics, for example, and knows the essential facts, he will find the account here unnecessary, and if he is ignorant, the information given is too imperfect to enable him to fill the gap and join the well-equipped minority to whom the well-intentioned book is not dedicated.

*Air Sickness*, by Cruchet and Moulinier (John Bale, Sons & Danielsson, Ltd., price 5s. net), reflects the highest credit upon its authors, who are well known both as pioneers and authorities on the physiology of aviation. The subjects dealt with include air sickness; the advance in the physiology of flight since 1914; the importance of arterial hyper-extension and of such factors as cold, fatigue, intellectual effort, emotion, and last but not least speed. Training and overwork are discussed, also the physical and psychical accidents connected therewith. The final section is devoted to the general hygiene of flying, with some sage advice to airmen. The chief indications to flying are then laid down. The work is an important contribution to the "conquest of the air."

*Nervous and Mental Diseases*, by Archibald Church, M.D., and Frederick Peterson, M.D. (W. B. Saunders Co., Ltd., price 30s. net).

## Notes on Books

The present is the ninth edition of this textbook on Nervous and Mental Diseases. There has been but little change on the previous editions. It still remains an excellent textbook of the usual type.

Dr J. Magnus Redding's *Aids to Electrotherapeutics* (Baillière, Tindall & Cox, 1920, 5s. net) is a useful addition to the well-known "Aids Series." In no way ambitious, it is a sound guide to electrical and radiological methods. From Messrs Cassell & Co. comes an addition to their "Modern Methods of Treatment Series" in the shape of *Diathermy* (7s. 6d. net), by Dr Claude Saberton. The volume gives ample information for the purposes of any one desiring to apply this form of electrical treatment.

One of the first desiderata in the extension of laboratory methods in general practice is that the practitioner should know how and when to procure his material for the pathologist, and also the sort of case in which the laboratory can aid him. *The Link between the Practitioner and the Laboratory*, by Drs Fletcher and Hugh M'Lean (Lewis & Co., 4s. 6d. net), ought to be useful from this point of view. It is practically an index of diseases and methods of collecting material, and we have found the information given accurate and trustworthy. This is a thoroughly useful little book.

The *Medical Annual* for 1920 (John Wright & Sons, Ltd., price 15s.) reflects the reaction in medical matters that has followed the strain of war years. Research and observation are gradually being redirected towards solving the problems of disease as it occurs in civil life, and the lessons learned under war conditions are being applied to more or less normal times. No better resumé of the year's progress could be wished for than that supplied by the *Medical Annual*.

The first two chapters of Mr Charles R. Whittaker's *Surface Anatomy*, now in its third edition (J. & A. Churchill, price 7s. 6d. net.), deal with the topography of the blood-vessels and nerves. The remainder of the subject is treated by regions in subsequent chapters. The student will find here, concisely stated, all the essentials of surface marking. The old anatomical terminology has been retained throughout.

*Modern Anæsthetics*, by J. F. W. Silk, M.D., second edition (Edward Arnold, price 7s. 6d. net.), is essentially a practical work on anæsthetics, local and general. It is of convenient size, modern methods are carefully explained, and an excellent account of the somewhat contradictory findings of recent experimental research is given.

*A Handbook of British Mosquitoes*, by William Dickson Lang, M.A., Sc.D. (printed by order of the trustees of the British Museum, price 20s.). The recent Memorandum issued by the Scottish Board of

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Health, inviting communications from medical practitioners as to the occurrence of anopheline mosquitoes in Scotland, will no doubt have aroused the interest of many of the recipients of the circular. To these and to others interested in mosquitoes we cordially recommend Dr Lang's handbook, which contains an admirably lucid account of the life-history and diagnostic characters of British mosquitoes. Twenty species are dealt with, and the characters by which they can be distinguished are clearly pointed out. With the help of the "keys" and the excellent illustrations the identification of any British mosquito, either adult or larvæ, can be readily accomplished. There is a useful "key" to the larvæ of the three British species of *Anopheles*—*maculipennis*, *bifurcatus*, *plumbeus*—and the distinguishing characters of the adults are also carefully stated.

*The House-fly, its Life-history and Practical Measures for its Suppression* (British Museum (Natural History) Economic Series. No. 1A, price 1s. 6d. net.). Major Austen gives in clear, terse style an account of the characters of the house-fly, shows how it may be distinguished from other flies frequently mistaken for it, and traces its life-history. He points out the capabilities of the house-fly as a carrier of pathogenic organisms, and describes those methods of attack on flies which have been found most successful, for instance, incineration of manure, close packing (or, in dry climates, spreading) of manure, trapping full-grown maggots and adult flies, poisoning flies by formalin in lime-water, by sodium arsenite solution, etc.—an excellent summary of practical measures which we recommend to the notice of medical officers and others who are confronted with "the fly-problem."

*The Coolidge Tube*, by H. Pilon (Baillière, Tindall & Cox, price 7s. 6d. net). The Coolidge tube, a recent invention, differs in many ways from any of its forerunners, and has already been well criticised. Its scientific applications (medical and industrial), its construction, the methods of heating the filament, and the starting and regulating of the tube are accurately described. The outstanding feature of this tube is that it can give indefinitely, without any appearance of fatigue, a radiation which another tube can only emit for a few seconds.



## TRANSACTIONS, REPORTS, Etc.

*Transactions of the Section on Genito-Urinary Diseases of the American Medical Association*, June 1916. Pp. 350. American Medical Association Press, Chicago. 1916.

Perusal of these papers and the discussions originating out of them reveals the general viewpoint of the urological surgeons of America as to the treatment of certain common ailments. Chronic prostatic disease is dealt with in several articles. H. H. Young and W. A. Frontz describe the preliminary treatment for prostatectomy in unfavourable cases. James A. Gardner describes the post-operative treatment of patients following prostatectomy. John L. Crenshaw has a paper on the post-operative complications following prostatectomy. Granville MacGowan writes on the subject of cancer of the prostate. J. Bentley Squier writes a paper on the post-operative and convalescent period of prostatectomy.

As regards the preliminary treatment for prostatectomy in unfavourable cases, the general consensus of opinion is that, in addition to the usual careful clinical observation of the patient, an accurate estimation of renal impairment can be best determined by means of the phenolsulphonaphthalein test. Young has this carried out twice weekly, and attaches great importance to the stationary period of phthalein elimination. This stability indicates that a sudden post-operative uremia is probably not to be feared. Combined with this examination the blood-urea test is a great help, as indicating in an exact manner the degree of renal insufficiency.

In the treatment following prostatectomy, the Mayo Clinic advocate the arrest of hæmorrhage by suturing the torn bladder wall with a running suture inserted around the internal vesical sphincter where the prostate has been removed. Many use a Hagner's bag to arrest bleeding from the prostatic bed. Others favour packing the cavity.

The American urological surgeon appears in the main to favour the treatment of carcinoma of the prostate by the application of radium. Several cases have shown so marked improvement as almost to amount to a cure, and in all improvement appears to be not only symptomatic but actual.

Beer, who originally introduced the treatment of papilloma of the bladder by fulguration, communicates a paper on the surgical therapy of benign and malignant tumours of the urinary bladder. His paper and the subsequent discussion revealed the fact that the treatment of villous papilloma by fulguration is now virtually the universal practice of all urological surgeons in America.

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*Transactions of the American Association of Genito-Urinary Surgeons*, Vol. XII. Published for the Association by Williams & Wilkins Company, Baltimore, Maryland. 1919.

The American Association of Genito-Urinary Surgeons held their 31st Annual Meeting at Atlantic City in June of last year. Any of the nineteen communications that this volume contains is worthy of careful study, but that by Dr Hugh Young, Dr W. A. Frontz, and Dr J. C. Baldwin on "Congenital Obstruction of the Posterior Urethra" is the most outstanding. This article refers to some brilliant pioneer work in urological surgery recently done under Dr Young in the Brady Urological Institute of the Johns Hopkins Hospital. They mention that the earliest record of the deformity was published by Langenbeck in 1802, and since then twenty-three further authentic cases have been recorded. In 1912 the first clinical diagnosis of valvular obstruction of the posterior urethra was made, this case being subsequently operated on by Dr Young in the Johns Hopkins Hospital, and in their present communication they mention that in the last six years there have been admitted to the hospital twelve cases showing this condition. The deformity is therefore of much more common incidence than has been suspected. One-third have been observed in patients under one year; a further quarter in patients aged from one to five years. The discussion revealed a fact that many readers will confirm, that similar cases have been observed by them at autopsies on infants. Following Dr John Thomson, it has been the custom in the Edinburgh Medical School to consider these as cases of congenital vesical sphincteric stenosis, comparable to congenital pyloric stenosis in infants. The constant presence of marked dilatation of the internal vesical sphincter and prostatic urethra, however, does not support this contention.

## BOOKS RECEIVED

ALBEE, FRED. H. Orthopedic and Reconstruction Surgery	( <i>W. B. Saunders Co., Ltd.</i> )	5os.
BALFOUR, Lady FRANCES. Dr Elsie Inglis.	( <i>British Periodicals, Ltd.</i> )	2s. 6d.
BARUCH, SIMON. An Epitome of Hydrotherapy	( <i>W. B. Saunders Co., Ltd.</i> )	1os.
BERKELEY, COMYNS. A Handbook of Midwifery. Fifth Edition	( <i>Cassell &amp; Co., Ltd.</i> )	7s. 6d.
BLACKHAM, ROBERT J. Military Sanitation. Third Edition	( <i>John Bale, Sons &amp; Danielsson, Ltd.</i> )	1os. 6d.
BOWLBY, Sir ANTHONY A., and Sir FREDERICK W. ANDREWS. Surgical Pathology and Morbid Anatomy. Seventh Edition	( <i>J. &amp; A. Churchill</i> )	3os.
BROOKE, GILBERT E. Medico-Tropical Practice. Second Edition	( <i>Charles Griffin &amp; Co., Ltd.</i> )	18s.
BUXTON, DUDLEY WILMOT. Anaesthetics. Sixth Edition	( <i>H. K. Lewis &amp; Co., Ltd.</i> )	21s.
CARTER, ALFRED H. The Elements of Practical Medicine. Eleventh Edition . . . . .	( <i>H. K. Lewis &amp; Co., Ltd.</i> )	16s.
COPESTAKE, BEATRICE M. GOODALL. The Theory and Practice of Massage. Third Edition . . . . .	( <i>H. K. Lewis &amp; Co., Ltd.</i> )	12s. 6d.
CRAMER, W. Directions for a Practical Course in Chemical Physiology. Fourth Edition . . . . .	( <i>Longmans, Green &amp; Co.</i> )	4s. 6d.
DACOSTA, J. CHALMERS. Modern Surgery: General and Operative	( <i>W. B. Saunders Co., Ltd.</i> )	37s. 6d.
EINHORN, MAX. The Duodenal Tube and its Possibilities	( <i>W. B. Saunders &amp; Co., Ltd.</i> )	13s.
ELLIOT, ROBERT HENRY. Tropical Ophthalmology	( <i>Henry Frowde and Hodder &amp; Stoughton</i> )	31s. 6d.
FREYER, Sir PETER J. Enlargement of the Prostate. Fifth Edition	( <i>Baillière, Tindall &amp; Cox</i> )	1os. 6d.
GASK, GEORGE E., and HAROLD W. WILSON. Edited by Surgery	( <i>J. &amp; A. Churchill</i> )	42s.
GRADWOHL, R. B. H., and A. J. BLAIVAS. Blood and Urine Chemistry. Second Edition . . . . .	( <i>Henry Kimpton</i> )	3os.
GULLAN, M. A. Theory and Practice of Nursing	( <i>H. K. Lewis &amp; Co., Ltd.</i> )	1os. 6d.
HARE, HOBART AMORY. Diagnosis of Disease. Eighth Edition	( <i>Henry Kimpton</i> )	36s.
HUTCHISON, ROBERT, and HARRY RAINY. Clinical Methods. Seventh Edition . . . . .	( <i>Cassell &amp; Co., Ltd.</i> )	12s. 6d.
KER, CLAUDE BUCHANAN. Infectious Diseases. Second Edition	( <i>Henry Frowde and Hodder &amp; Stoughton</i> )	42s.
LUMB, NORMAN. Gonococcal Infection in the Male	( <i>John Bale, Sons &amp; Danielsson, Ltd.</i> )	25s.
MACBETH, A. KILLEN. Organic Chemistry . . . . .	( <i>Longmans, Green &amp; Co.</i> )	6s. 6d.
M'LAREN, EVA SHAW. Elsie Inglis: The Woman with the Torch	( <i>Society for Promoting Christian Knowledge.</i> )	Cloth, 3s. 6d.; paper, 2s. 6d.
MAYOU, M. S. Diseases of the Eye. Third Edition	( <i>Henry Frowde and Hodder &amp; Stoughton</i> )	1os. 6d.



# Books Received

MENNELL, JAMES B. Massage: Its Principles and Practice. Second Edition . . . . .	(J. & A. Churchill)	21s.
NEWSHOLME, Sir ARTHUR. Public Health and Insurance	(The Johns Hopkins Press)	\$2.50
PHARMACOPŒIA of the Queen's Hospital for Children. Sixth Edition	(H. K. Lewis & Co., Ltd.)	4s. 6d.
RAMSAY, A. MAITLAND. Clinical Ophthalmology	(Henry Frowde and Hodder & Stoughton)	42s.
RIVAS, DAMASO. Human Parasitology . . . . .	(W. B. Saunders Co., Ltd.)	35s.
ROSANOFF, AARON J., Edited by. Manual of Psychiatry. Fifth Edition	(Chapman & Hall)	22s.
SCHAFER, Sir EDWARD SHARPEY. The Essentials of Histology. Eleventh Edition . . . . .	(Longmans, Green & Co.)	14s.
SCHMIEDEN, VICTOR, and ARTHUR TURNBULL. The Course of Operative Surgery. Second Edition . . . . .	(Baillière, Tindall & Cox)	25s.
SHIPSEY, MICHAEL B. Cardiac Disease and the Normal Heart	(Cornish Brothers, Ltd.)	1s. 3d.
SHIPSEY, MICHAEL B. A Scientific Explanation of Christian Science	(Cornish Brothers, Ltd.)	9d.
SYNOPTIC CHART of Cardiac Examination. Second Edition	(John Bale, Sons & Danielsson, Ltd.)	4s. 6d.
TIDY, HENRY LETHEBY, A Synopsis of Medicine	(John Wright & Sons, Ltd.)	25s. net
TRANSACTIONS of the American Pediatric Society, Vol. XXXI., 1919		
VARIOUS AUTHORS. Chirurgie Réparatrice et Orthopédique	(Masson et Cie.)	In two tomes. Frs. 80
WALKER, T. AINSLIE. Intestinal Disinfection	(Universal Medical Periodicals, Ltd.)	6d.
WHITTAKER, C. R. Surgical Anatomy. Catechism Series. Part II. Second Edition . . . . .	(E. & S. Livingstone)	1s. 9d. per part
WINGFIELD H. E. An Introduction to the Study of Hypnotism. Second Edition . . . . .	(Baillière, Tindall & Cox)	7s. 6d.
WOODHEAD, Sir GERMAN, and P. C. VARRIER JONES. Industrial Colonies and Village Settlements for the Consumptive	(Cambridge University Press)	Paper covers, 9s. ; cloth, 10s. 6d.

# Edinburgh Medical Journal

December 1920

## CARCINOMA OF THE POST - CRICOID REGION (*PARS LARYNGEA PHARYNGIS*) AND UPPER END OF THE ŒSOPHAGUS.\*

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### ANATOMY AND PATHOLOGY.

BEFORE studying the clinical aspect of carcinoma of the upper end of the gullet, it is necessary, in the first place, to draw attention to certain anatomical points, and then to examine the pathological material at our disposal, so that the clinical data may be placed upon a more satisfactory basis. A malignant tumour is the most frequent cause of Œsophageal stricture, and it is more prone to affect those parts of the tube which present anatomically some narrowing of the lumen. These areas are the ostium of the Œsophagus and the aortic, bronchial, and diaphragmatic constrictions. It is advisable, however, in considering the question of carcinoma at the upper end of the Œsophagus, to study the anatomy of the pharynx with which the gullet is directly continuous. The portion of the pharynx which constitutes the upper part of the alimentary canal is subdivided by anatomists into two sections—the oral pharynx which intervenes between the soft palate above and the superior aperture of the larynx below, and the laryngeal section, *pars laryngea pharyngis*, which terminates at the lower border of the cricoid cartilage, where it is continued as the Œsophagus. The anterior boundary of the *pars laryngea* is formed from above downwards by the epiglottis, the superior aperture of the larynx, enclosed laterally by the arytæno-epiglottidean folds with the pyriform sinuses lying external to them, while lower down the

\* This paper is published in greater detail in the *Journal of Laryngology, Rhinology, and Otology* for February 1920, as part of the Annual Reports of the Ear and Throat Department, Royal Infirmary, Edinburgh.

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arytenoid cartilages and the large plate of the cricoid cartilage complete the anterior boundary. In the latter situation the anterior wall of the *pars laryngea* is in contact with the cervical vertebræ, so that the canal is narrowed and constitutes a distinct area of constriction. In this area carcinoma is liable to develop; consequently, it is necessary to include the post-cricoid region when considering the question of malignant disease at the upper end of the œsophagus.

The examination of thirty-one post-mortem specimens of carcinoma of the œsophagus throws some light upon the proclivity of the disease to attack the anatomical areas referred to above.\* In five of the preparations the tumour implicated the *pars laryngea pharyngis*; in two of these it was confined to that area (Plate I, Fig. 2), and, in the remaining three, the ostium and the extreme upper end of the œsophagus also were involved (Plate II.). It was difficult to determine the actual site of origin of the growth in the latter, but the preparations demonstrate, as clinical experience also bears out, that the disease may be found in both situations in the same subject. In five specimens the tumour involved the extreme upper end of the œsophagus, extending downwards from the ostium for a distance of one to two inches. In three other preparations it was situated in the cervical œsophagus, the upper margin of the tumour being 1,  $1\frac{1}{2}$  and 2 ins. respectively below the ostium (Plate I, Fig. 1). As regards the eighteen specimens of intra-thoracic tumour, four were situated at the level of the aortic constriction, ten at and immediately below the level of the bifurcation of the trachea (Plate III.), and four at the diaphragmatic area and extreme lower end of the œsophagus. It is evident, therefore, from a study of these preparations that carcinoma has a predilection for the anatomical areas above described, though it may occur elsewhere, as is shown by its presence in the lower part of the cervical œsophagus.

It is not possible for the laryngologist to give, from his clinical experience, reliable data as to the relative frequency of the tumour in the different areas. He approaches the subject from the standpoint of the throat specialist, who is consulted mainly by patients whose difficulty in swallowing is referred to the region of the larynx and cervical œsophagus,

\* Preparations examined from my own collection, from the Museum of the Royal College of Surgeons of Edinburgh, and from the Musée Dupuytren, Paris.





FIG. 1.

From a woman, aged fifty-nine. A. Squamous epithelioma at upper end of œsophagus. B. Perforation into trachea; pneumonia.

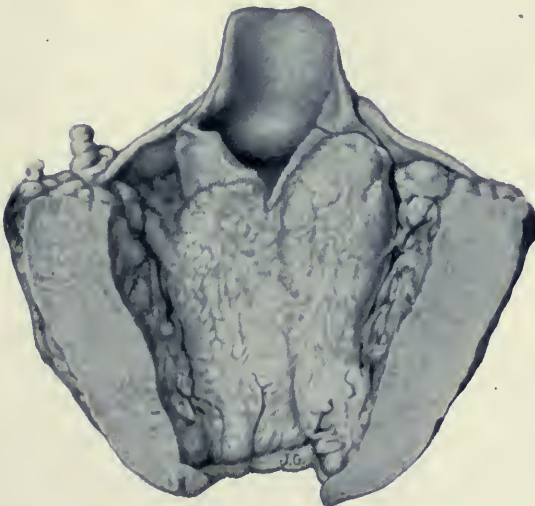
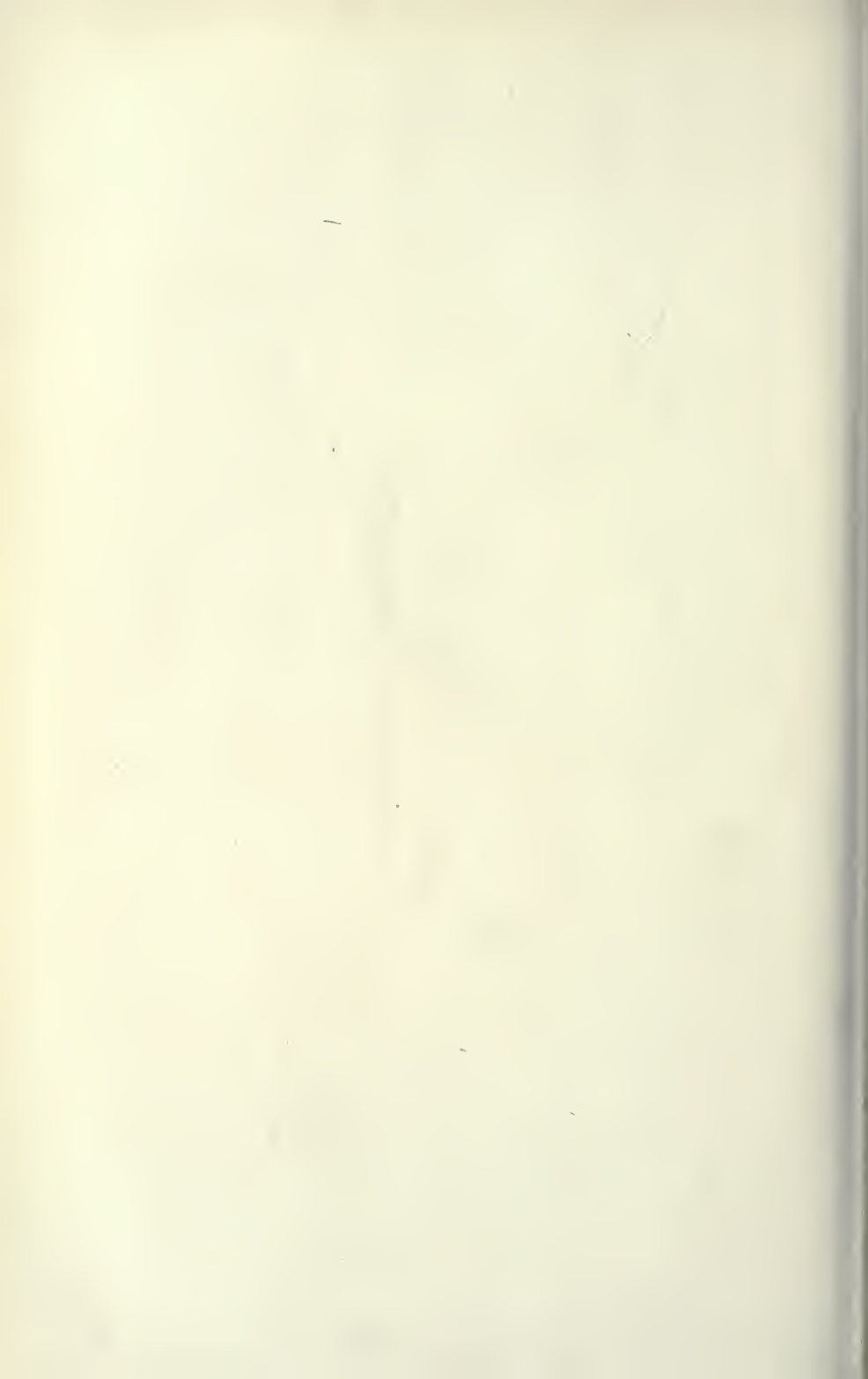


FIG. 2.

Squamous epithelioma of the post-cricoid region showing infiltration of the mucous membrane covering the posterior surface of the cricoid and arytenoid cartilages.



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though possibly the more extended use of the œsophagoscope, in his hands, may bring an increasing number of cases of intra-thoracic obstruction under his notice. The 140 cases which form the basis of this paper are grouped according to the situation of the disease as follows: Pars laryngea pharyngis, with or without involvement of the upper end of the œsophagus, 98; cervical œsophagus, 19; level of tracheal bifurcation, 9; lower end of œsophagus, 14.\*

The squamous-celled epithelioma is the most common variety of malignant tumour met with in the œsophagus. It constitutes, according to Butlin, 90 per cent. of the tumours examined. With one exception—a case of medullary carcinoma—it was the only variety met with in this series. As a rule only one tumour is found, but the possible occurrence of a second growth at some distance from the first must not be lost sight of. It is obvious that the existence of such in the thorax would have an important bearing upon the question of treatment, when the removal of a limited cervical or post-cricoid growth was under discussion. In none of the preparations just described was there any evidence of a second growth, but in two patients with post-cricoid carcinoma a second stricture, separated from the first by a distinct interval of normal gullet, was met with in the thorax. As no post-mortem examination was made upon either of them, the precise nature of the second obstruction was not ascertained. It was left in doubt, therefore, whether the stenosis was due to a second intrinsic carcinoma or to pressure upon the lumen of the œsophagus from enlarged intra-thoracic glands. Had the patients been screened and bismuth administered, further light might have been thrown on the condition. Morrision Davies† has described the post-mortem examination of a case in which the main growth was situated in the cervical lumen and a second smaller one was found at the tracheal bifurcation. The intervening mucous membrane presented a normal appearance. Davies points out that two tumours are found sometimes in the colon and rectum. As the descending contents both of the œsophagus and colon are solid, cells may be detached from the primary tumour and deposited lower down.

\* The clinical material is derived from my hospital records and private case books during the years 1907-19.

† Morrision Davies, *British Medical Journal*, London, 12th February 1910.



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The disease, at first superficial and confined to the mucous coat, involves a limited area of the circumference of the lumen, but as it increases in size it encircles not only the whole of the tube but spreads in the long axis. Our post-mortem specimens, which may be regarded as illustrating the disease in an advanced stage, demonstrate that one, two, or more inches of the vertical axis of the œsophagus may be implicated. In two preparations in which the disease was confined to the pars laryngea pharyngis, the tumour extended from the mouth of the œsophagus to the mucosa covering the arytænoid cartilages and arytæno-epiglottidean folds, and in one of them the right pyriform sinus was filled with the growth. When the tumour occupied both the œsophagus and the post-cricoid areas or was confined to the cervical portion of the gullet, from one to two inches and a half of the vertical axis were implicated. Clinical experience furnishes additional evidence of the extensive area which the tumour may occupy. In two instances in which the œsophagus was exposed with the object of performing œsophagostomy, the lower limit of the growth, in each case, was at the level of the suprasternal notch, rendering it impossible to introduce an œsophageal feeding-tube below the tumour. The upper border of the growth in each case could be seen with the laryngoscope as a projecting edge of infiltration behind the arytænoid cartilages, thus incidentally demonstrating at the same time the combination of post-cricoid and œsophageal carcinoma.

These facts furnish ample evidence of the necessity of making an early diagnosis, if success in treatment is to be attained. But the pathology of the tumour must be studied from another aspect than its mere intrinsic development. The penetration of the muscular coat of the gullet and the invasion of the tissues and organs in its immediate neighbourhood are factors of considerable moment to the surgeon. While in many of the cases the rate of growth is comparatively slow in the purely intrinsic stage, and the tumour can be dealt with more successfully, both its progress and its suitability for removal undergo a change when it passes outside the canal. The cervical lymphatic glands, which hitherto may have escaped involvement, may enlarge upon one or both sides of the neck. An analysis of the case records in 117 cases of the disease in the cervical region shows that, on examination, enlarged glands were detected in 46, noted as absent in 26, while in 45 cases no observation on this point had been recorded.



Squamous epithelioma of the upper end of the œsophagus, involving the posterior wall of the post-cricoid region and extending into the right pyriform sinus. On the left side the growth has eaten through the wall of the œsophagus and infiltrated the tissues of the neck, where an abscess-cavity is seen. No clinical history is attached to this specimen.





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The possibility of glandular infection which may escape detection is not improbable. In one of the pathological preparations the tumour, having made its way through the wall of the œsophagus, had caused secondary enlargement of two glands lying at the root of the neck, and, being concealed behind the right subclavian and common carotid arteries, could not be palpated. In addition to the infiltration of the surrounding cellular tissues and infection of the lymphatic glands, implication of the recurrent laryngeal nerves, of the sheaths of the large vessels and even the vessel-walls themselves, may take place. The wall of the trachea and the framework of the larynx may be attacked, the tumour infiltrating and narrowing the lumen of the air passages. Perforation into the trachea in a case of malignant stricture of the cervical œsophagus is seen in the illustration upon Plate I. B. Thorough palpation of the neck and careful consideration of the appearances seen both by indirect and direct laryngoscopic examination will assist the surgeon in determining the extent to which the tumour has invaded the surrounding structures.

Secondary involvement of the thyroid gland is a complication which is liable to be overlooked in the study of the pathology of œsophageal carcinoma. Consequently, when the gland is the seat of malignant disease, the possibility of the tumour being secondary to a primary focus in the pars laryngea pharyngis or cervical œsophagus must be borne in mind. Morrision Davies, in the paper already referred to, lays special stress upon this point, and states that a secondary tumour of the thyroid was found in four cases of carcinoma of the cervical œsophagus treated in University College Hospital during a period of five years. In six of the cases in our series definite enlargement of one lobe of the thyroid gland was observed, in four of them no microscopic examination was made, but in two the malignant nature of the enlargement was ascertained. One of these was the case of a young woman, aged 29, who presented the clinical picture of a malignant thyroid gland. A feeling of fullness in the throat, accentuated on swallowing and accompanied by a dragging sensation in the neck, had existed for some months. Shortly before her admission to hospital a slight noisy respiration was noticed. These symptoms were quite compatible with the malignant character of the thyroid gland enlargement. When she came under the care of Mr J. M.

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Graham, F.R.C.S.E., she made no complaint of dysphagia and was able to take her food in comparative comfort. As the respiratory difficulty was not relieved by the operation upon the gland, a laryngoscopic examination was made ten days later. A sloughing, ulcerated infiltration attached to the posterior pharyngeal wall was disclosed behind the arytaenoid cartilages, the malignant character of which was demonstrated. The second case, under the care of Mr J. W. Dowden, F.R.C.S.E., was that of a woman, aged 31, whose thyroid gland was enlarged, hard, and adherent to the trachea. The patient could only swallow liquids and had become considerably emaciated. Suspension laryngoscopy revealed the primary condition behind the cricoid cartilage in the form of an irregular, ulcerated infiltration, which, on microscopic examination, proved to be a squamous epithelioma. In cases of malignant disease of the thyroid gland, especially when it occurs in comparatively young women, preliminary laryngoscopy, and, if necessary, œsophagoscopy should be carried out as a matter of routine before operation upon the gland is undertaken.

### SEX AND AGE-INCIDENCE OF POST-CRICOID CARCINOMA.

The more frequent occurrence of malignant disease at the upper end of the œsophagus amongst women, and at the lower end in men, has been recognised over a considerable period of time. In thus stating the case, however, it is necessary to point out again that the pars laryngea pharyngis must be included. The tumour may be confined to the latter area, or it may involve it and the upper end of the œsophagus. It may be difficult to determine the exact site of origin, nevertheless the frequent occurrence of the disease behind the cricoid cartilage constitutes a clinical type which justifies us in placing these cases in a special group. In 98 of the 140 patients in the series the tumour was situated behind the larynx; of these, 85 were women and 13 were men. Table I. demonstrates, at a glance, the relative frequency of the disease in the two sexes and the different localities affected.

TABLE I.—*Carcinoma of the Post-cricoid Area and Œsophagus, showing Sex-incidence in 140 Patients.*

Situation.	Total Cases.	Males.	Females.
Post-cricoid area . . .	98	13 (13%)	85 (86%)
Œsophagus (cervical) . .	19	11 (57%)	8 (42%)
„ (aorta, trachea) . . .	9	6 (66%)	3 (33%)
„ (lower end) . . .	14	13 (92%)	1 (7%)

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It is interesting to observe that in the column tabulated under "Males" there is a steady increase in the percentage of men affected, as we pass from the region of the pharynx downwards towards the stomach; while in the column headed "Females" exactly the opposite may be noted.

These facts relative to the sex-incidence, showing the undoubted tendency of the tumour to attack the pars laryngea pharyngis in women, led me to investigate the sex-incidence of carcinoma upon the mucous membrane of the tongue, fauces, oral pharynx and the stomach along with that of the larynx, lying in such close proximity to the pharynx. With the exception of the stomach, the material selected for this purpose was derived from my case records during the period 1907-19. My information regarding malignant disease of the stomach has been obtained from papers written by Robson and Moynihan, Osler and James Langwill (working with Professor F. M. Caird), and from statistics of the Mayo clinic. The facts obtained from these different sources become more clear when shown in tabular form, as in Table II. The nasal pharynx has not been included in the investigation as it forms part of the respiratory and not the alimentary passage.

TABLE II.—*Sex-incidence of Carcinoma of the Tongue, Fauces, Oral Pharynx, Œsophagus, Stomach, and Larynx.*

TOTAL CASES—859.			
Situation.	Cases.	Males.	Females.
Tongue (primary) . . .	18	16 (88%)	2 (11%)
Fauces, soft palate, tonsils .	71	66 (92%)	5 (7%)
Oral pharynx . . .	26	15 (57%)	11 (42%)
Post-cricoid area . . .	98	13 (13%)	85 (86%)
Œsophagus . . .	42	30 (71%)	12 (28%)
Stomach . . .	535	372 (69%)	163 (30%)
Larynx . . .	69	59 (85%)	10 (14%)
	<u>859</u>	<u>571 (66%)</u>	<u>288 (33%)</u>

It is clear from a study of the total figures and percentages on Table II. that, throughout the whole area under review, the number of males suffering from carcinoma exceeded the females in the proportion of 2 to 1. Closer inspection of the individual areas, however, brings to light the fact that, while on the tongue and fauces, in the Œsophagus, stomach, and larynx, the males greatly predominate, on the pharyngeal mucous membrane the relation of the two sexes to each other is very different.



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In the oral pharynx the disease attacks the two sexes more equally, 57 per cent. of the cases being in men and 42 per cent. in women, while in the post-cricoid region of the pharynx the whole position is reversed. As we have indicated above, the women are affected in 86 per cent. and the men in 13 per cent. of the cases. In other words the pharyngeal mucosa in women appears to be more vulnerable or more liable than in men to the development of squamous-celled epithelioma, especially in the lowest part, whereas in the rest of the upper part of the alimentary canal the mucous membrane is more prone to this form of tumour growth in men. In connection with this aspect of the subject it is further of interest to compare the figures bearing upon the sex-incidence in the post-cricoid area and in the contiguous organ, the larynx: in the former, males 13 per cent., females 86 per cent.; in the larynx, males 85 per cent., females 14 per cent. The latter figures include both intrinsic and extrinsic carcinoma of the larynx.

*Age-incidence.*—In studying the age-incidence of post-cricoid carcinoma, we find that along with the greater tendency of the disease to affect women, the tumour likewise develops at an earlier age in the female than in the male sex. Table III. illustrates this point.

TABLE III.—*Age-incidence of Patients with Carcinoma in the Post-cricoid Area.*

CASES—98.			
Decades.	Males.	Females.	
21—30 . . .	0	6	
31—40 . . .	2	27	
41—50 . . .	1	20	
51—60 . . .	5	26	
61—70 . . .	4	4	
71—80 . . .	1	2	

The two youngest patients in the series were women aged 28, but a few exceptional cases, in which the disease occurred even at an earlier age, have been recorded. The youngest was that of a woman aged 19; Herbert Tilley has met with it in a woman of 22, and W. R. H. Stewart has published a case in a woman aged 23. In fifty-three of the women in Table III. the tumour was present before they had reached the age of 50. The youngest man in the series was aged 34, and though the actual number of males is not large, the majority of the cases were met with after the age of 50.



Squamous epithelioma of oesophagus at level of bifurcation of trachea. Nodular infiltration beneath the epithelium extending upwards above the ulcer. Perforation of wall with abscess extending over posterior surface of right lung. Female, aged forty-three. Duration of symptoms, eleven years. Very little emaciation. Fluids swallowed up to time of death. Posterior mediastinal abscess and pneumonia.





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Table IV. has been added in order to show that in the oral pharynx there is the same tendency for the disease to affect women at an earlier age than men.

TABLE IV.—*Age-incidence of Patients suffering from Carcinoma in the Oral Pharynx.*

CASES—26.					
Decades.				Males.	Females.
21—30	.	.	.	0	1
31—40	.	.	.	1	3
41—50	.	.	.	1	4
51—60	.	.	.	4	1
61—70	.	.	.	9	2
71—80	.	.	.	0	0

In order to furnish a general comparison of the *average* age-incidence of the tumour in the two sexes throughout the different regions dealt with under "Sex-incidence," a fifth table is given. No figures dealing with the stomach were available.

TABLE V.—*Average Age-incidence in the Two Sexes in all the Areas under Review.*

CASES—324.						
Situation.	Cases.	Males.	Average age-incidence.	Females.	Average age-incidence.	
Tongue (primary)	18	16	61 years	2	51 years	
Fauces, etc.	71	66	59 "	5	56 "	
Oral Pharynx	26	15	59 "	11	45 "	
Post-cricoid area	98	13	57 "	85	45 "	
Œsophagus	42	30	55 "	12	48 "	
Larynx	69	59	60 "	10	56 "	

The above table requires no special analysis; in every instance the average age-incidence is less amongst the women than the men, but the difference is most noticeable in the oral pharynx and post-cricoid regions.

## DURATION OF THE DISEASE.

It is very difficult to make an accurate estimation of the duration of the life of the tumour. The only basis that can be employed for this purpose is the patient's statement as to the duration of symptoms. This is not free from fallacy, and furthermore it cannot be accepted as reliable in every case, as many patients are uncertain as to the time at which their symptoms commence. There is another factor which detracts from the value of the history as a basis for estimating the life

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of the tumour. Experience shows that the period during which symptoms are present is often quite independent of the size which the tumour has attained. Thus, one patient will assert in perfect good faith that she suffered no inconvenience until one, two, or three days before advice was sought, yet examination reveals extensive tumour-formation behind the larynx. Another will give a history of difficulty in swallowing for nine months, and a very limited area of disease is found. The very long period during which many of the female patients maintain that they have had obstruction—in some cases extending over a number of years—makes it extremely improbable that a tumour could have existed during the whole of the time covered by the history.

There is not only a great difference in the life-history of similar types of tumour growing in different parts of the body, but also in the course of tumours of like structure arising in the same part of the body and under apparently similar conditions. Our experience suggests that in the upper part of the œsophagus the squamous-celled epithelioma shows a lower grade of malignancy in some patients than in others, but although in many of the women the symptoms cover a much longer period of time than they do in the men, probably it would be incorrect to assume that the degree of malignancy had a sex basis. In those women whose period of symptoms is unusually prolonged it is possible that a condition may exist which favours tumour development and is the cause of the obstruction in the earlier stages of the history.

At the meeting of the Laryngological Section of the Royal Society of Medicine held in May 1919, Drs A. Brown Kelly and D. R. Paterson drew attention to the not infrequent occurrence of difficulty in swallowing in women due to the existence of spasm at the entrance of the œsophagus. While a few of the patients are neurotic, and as such may be predisposed to this affection, the majority show no sign of such a temperament. It is now the experience of many laryngologists that a considerable proportion of the women who suffer for a number of years from spasmodic difficulty in swallowing, develop eventually carcinoma in the laryngeal part of the pharynx. When we consider that the majority of cases of cancer at the entrance to the gullet occur in women, the question arises whether there may not be something at this site peculiar to the sex which predisposes it both to spasm and to

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cancer. Whatever direction future inquiry may take for the elucidation of the subject, it appears to me that we should not lose sight of the fact, which our figures disclose, that carcinoma not only attacks in a preponderating degree the mucous membrane of the pars laryngea pharyngis in women, but it shows also a considerable tendency to affect the mucosa of the oral pharynx in the same sex. It is possible that an investigation into the sex- and age-incidence and the duration of malignant tumours throughout the whole length of the alimentary canal might throw some further light upon the origin and history of the tumour in this particular situation.

If the history be compared in the two sexes, in our series of post-cricoid carcinomata, a striking difference is found in the length of the period during which some interference in swallowing is complained of. In the case of the thirteen men in the series the duration of the symptoms varied from three weeks to nine months, while the average duration was four and a half months. In eighty-one women from whom the history on this point was ascertained great variations were observed. On the one hand, the case of sudden, acute obstruction dating from the previous day presented itself, while, on the other hand, difficulty in swallowing had been experienced for thirty years. Although the latter was an exceptional case, yet the long duration of the symptoms in women was by no means uncommon. In thirty instances the period varied from one year to two, four, six, eight, and—in one case—twenty-three years. Four women stated that as long as they could remember they were obliged to eat slowly, explaining the fact on the ground that they had “a narrow throat.” If the average duration of the symptoms be calculated in the women, including the two exceptional cases of twenty-three and thirty years, it is found to cover a period of two years and four months, and if these two cases be eliminated the period is reduced to one and a half years.

### DIAGNOSIS.

The sex, age-incidence, and duration of the symptoms form part of the clinical picture presented by cases of post-cricoid carcinoma. There are, however, some additional points which must be taken into consideration. An early diagnosis is essential if operative interference is to be attended with any success, and it is evident from what has been said regarding



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the pathology of the tumour that its removal is most desirable while the disease is still confined to the interior of the pharynx and gullet.

*The Mode of Onset.*—This has, to some extent, been indicated while discussing the period of time covered by the symptoms, but it is still necessary to draw attention to the variations met with in their onset. Obstruction may arise suddenly, following upon the sensation of a bone or piece of meat lodging in the throat. Prior to this, the patient may have been quite unconscious of any uneasiness referable to deglutition, though the tumour has attained considerable size. The difficulty, or even total inability to swallow, remains, and the condition is comparable to the sudden acute obstruction observed in cases of malignant disease of the bowel. On the other hand, an entirely different mode of onset presents itself, where a slow and gradually progressive difficulty is complained of during a period of weeks or months, and, in some cases, even of years. There is a danger that, in both of these types, met with more frequently in women, the disorder may be regarded as functional. The inability to swallow after a bone has lodged temporarily in the throat may suggest a functional disturbance; so also may the obstruction to the swallowing of solid food continued over a very long period of time. No diagnosis should be made without a careful examination with the laryngoscope, and with the œsophagoscope if need be.

*Dysphagia.*—Pain, associated with the difficulty in swallowing, is by no means uncommon. It may be absent, however, in the earlier stages of the disease, but supervene later. As a rule it is complained of at the site of the obstruction, but in many instances it is referred to one or both ears. The question of pain was inquired into in 74 cases, and it was found to exist in 59.

*A gurgling noise* during deglutition when fluid passes over the throat is recognised occasionally by the patient, and the surgeon during his examination may advantageously test for this phenomenon by asking the patient to drink water. We have noticed this symptom in association with the regurgitation of food, and in all probability both are due to the narrowness of the stricture. *Bleeding* is not a common occurrence, though occasionally blood stains the expectoration. An *excess of mucous secretion* in the throat is complained of very frequently—a sign which is strongly suggestive of the presence of an organic stricture.

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*Cough* is occasionally a troublesome symptom. In one case severe spasms of coughing were the first, and, for a few months, the only symptom for which the patient sought advice.

*Hoarseness*, or some alteration in the character of the voice, occurs either as the result of involvement of one or other of the recurrent laryngeal nerves or from extension of the disease into the larynx, as we have pointed out in discussing the pathology of the tumour. For the same reason, difficulty in breathing may supervene, sometimes of such a nature as to make tracheotomy necessary. In thirty-three of the patients suffering from post-cricoid carcinoma, hoarseness was present when the patient came under examination, and in fourteen some slight respiratory difficulty was noted. In several cases in which voice and respiration were normal when advice was sought, laryngeal symptoms developed subsequently, and in some instances tracheotomy became necessary.

### PHYSICAL EXAMINATION OF THE PATIENT.

External palpation of the neck and of the larynx and trachea should be carried out in all cases. Reference has been made above to the enlargement of the cervical lymphatic glands and thyroid gland (p. 349). It is also advisable to determine by palpation as to whether the framework of the larynx and trachea shows thickening indicative of the extension of the disease beyond its original site. In several cases of post-cricoid carcinoma, pressing the larynx backwards against the vertebral column or the gentle insertion of the fingers and thumb between the larynx and the sterno-mastoid muscles has elicited tenderness.

It is not our intention in this paper to give a detailed account of the laryngoscopic appearances that may be observed in a great many of these cases. The subject has been fully dealt with elsewhere. Our purpose is to emphasise the necessity of having a laryngoscopic examination made, and combining it, if necessary, with the employment of the œsophagoscope in all cases in which difficulty in swallowing at the upper end of the gullet is complained of, and to insist that the diagnosis of functional derangement should not be made until a physical examination of this kind has excluded evidence of organic mischief. At the same time, we must deprecate the use of the œsophageal bougie as a diagnostic agent. The history of

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the patient has already informed us that there is obstruction : the bougie gives no satisfactory explanation of the cause, and its employment in a case in which malignant ulceration is present, is not free from serious risk to the patient.

In too many instances, patients, examined only with the tongue depressor, have been treated with gargles and sprays, while, possibly on account of their age and sex, they have been dismissed with the information that there is nothing seriously the matter with them, to return finally with a well-developed malignant tumour which can no longer be successfully removed.

If the laryngeal mirror fails to demonstrate any change from the normal, suspension laryngoscopy, which gives a more extensive view into the part of the pharynx lying behind the larynx, may be employed, or the œsophagoscope may be preferred. By both of these direct methods of examination the tumour may be brought under the observation of the examiner, and in a number of cases a piece of the growth may be removed at the same time and prepared for microscopic examination.

The X-rays may be employed along with a bismuth meal as an additional method of investigation. It may provide useful information regarding the position and the length of the stricture, though in early cases of disease it may prove disappointing. A knowledge of the vertical extent of the stricture is valuable if removal of the tumour is under consideration, or, if that procedure be regarded as impossible, as a necessary preliminary to the operation of œsophagostomy. Further, the rays may assist in detecting the presence of the rare, though not unknown, second stricture, which we have seen may be present within the thorax.

### PROGNOSIS AND TREATMENT.

In approaching the question of treatment we are conscious of doing so with the knowledge that the removal of malignant disease in this situation does not promise, in the majority of cases, results of a very gratifying kind. As a rule only palliative measures can be adopted, and amongst these we would include œsophagostomy and gastrostomy. The choice between the two procedures will depend upon the inclination of the individual surgeon. The selection of œsophagostomy, however, has this advantage—that in the exposure of the



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cervical gullet the operator, at the same time, has an opportunity of investigating by direct inspection and palpation the extent of the disease, and he is able finally to determine whether the case may not prove suitable for removal of the stricture.

Successful œsophagectomy is very dependent upon early diagnosis. Notwithstanding the advantages derived from suspension laryngoscopy, œsophagoscopy and X-rays, recognition of the disease in its earlier stages is not always possible. It is true that a better appreciation by the general body of the profession of the clinical types, which we have sought to make more clear in this paper, might lead to an earlier diagnosis, and consequently to more successful surgical treatment. Nevertheless the fact remains that the tumour, in a proportion of the cases, has grown to a considerable size before the patient is conscious of obstruction in swallowing, or feels the necessity of seeking advice. This will always prove an obstacle to successful removal, in spite of better knowledge regarding these cases and improvements in the methods of diagnosis.

Before coming to a decision upon the question of the suitability of any case for excision, the surgeon should receive from the laryngologist the fullest information possible as to the distribution of the tumour. He must employ external palpation for the detection of enlarged lymphatic glands thyroid enlargement, and the extension of the tumour beyond, the muscular walls of the tube; and the laryngologist must weigh the value to be attached to interference with the mobility of the vocal cords, and to the extent of the infiltration of the pharynx and larynx as disclosed by his direct examination, and he must ascertain the lower limit of the disease by the X-rays, or, if he sees fit, by the use of the œsophagoscope. In spite of the information which he may be able to give the surgeon, the latter may find, when operating, that even in the selected case the conditions prove to be less favourable for successful removal than were anticipated, unless he is prepared to carry through an operation involving considerable mutilation, such as is entailed in the removal of the larynx and even of a portion of the trachea.

The small number of cases regarded hitherto as suitable for œsophagectomy is apparent when we look at the statistics of operation in the series with which we are dealing. Of the 98 cases of carcinoma involving the post-cricoid area and

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extreme upper end of the œsophagus only 11 were subjected to excision, and in one of them entire removal of the disease was found to be impossible. In more than one apparently suitable case, however, the patient declined operation.

The question of excision, however, must be considered, not only from the point of view of its feasibility, but from its possible advantage to the patient both as regards increased comfort and expectation of life. As regards the former, there can be no doubt that the patient is benefited. Even if a primary end-to-end anastomosis is impossible—as is usually the case—the introduction of a permanent œsophageal feeding-tube into the divided end of the gullet allows of suitable nourishment being given. The removal of the disease and the relief of dysphagia are followed by improvement both in the weight and in the general well-being of the individual. If this end can be attained even for a few months, the patient should be given opportunity of coming to a decision on the matter.

With regard to the expectation of life after œsophagectomy, it is interesting to compare the cases operated upon with those in which no active interference was carried out. In the latter group, life was prolonged after the examination and diagnosis had been made over periods varying from a few weeks to five, six, seven or even eight months, the general average in the series being four months. In the ten cases, on the other hand, in which the disease was completely removed, the duration of life varied from three months to ten years. The actual figures were three, four, six, seven, and eight months: one year, one year and two months, and one year and six months. The two remaining patients were still alive at the time of writing, one two years and a half, and the other ten years after operation. The last case, number one in the series which was operated upon, was sent to me by Sir David Wallace, F.R.C.S.E., for special examination ten years ago, and since that time he has operated upon several others. It illustrates in an exceptional manner the advantage to be derived from operating on a tumour of small dimensions, situated on the posterior pharyngeal wall immediately behind the upper part of the cricoid plate. The two patients, alive six months and fourteen months after operation, were well at that period, but their further history could not be traced.

The subjoined notes give a short *résumé* of the cases in which excision of the tumour was carried out. I desire to acknowledge

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my great indebtedness to my surgical colleagues, Sir David Wallace, C.M.G., Sir Harold Stiles, Mr J. W. Dowden, Mr John W. Struthers, Mr Henry Wade, C.M.G., and Mr J. M. Graham for the opportunities which they have given me of studying their cases, and to thank them for the notes which they have kindly put at my disposal.

CASE I.—Mrs B., aged 37. Duration of symptoms, nine months. Larynx normal; a small ulcerating mass upon the posterior pharyngeal wall on the plane of the upper part of the cricoid plate. The tumour did not implicate the posterior wall of the larynx. Microscope: Squamous epithelioma. Operation by Sir David Wallace, 22nd November 1910. Patient examined in June 1920; in excellent health, still wearing her œsophageal feeding-tube.

CASE II.—M. P., female, aged 49. Difficulty in swallowing for four years; a cauliflower-like infiltration in the post-cricoid space with cedematous swelling of the mucous membrane on the posterior surface of the arytenoids. The vocal cords move freely. Microscope: Squamous epithelioma. Operation by Mr J. W. Struthers, 1st November 1912: excision of  $1\frac{1}{2}$  ins. of diseased and healthy mucosa. Patient died eighteen months later with local recurrence of the disease.

CASE III.—Mrs W., aged 38. Difficulty in swallowing for five months. Larynx normal. An ulcerated nodular infiltration of the mucous membrane covering the posterior surface of the cricoid plate. Removal by Sir David Wallace, March 1913. Patient died four months later.

CASE IV.—Mrs G., aged 28, seen in consultation with Dr W. T. Gardiner. Difficulty in swallowing for two weeks, but she has found it necessary always to masticate carefully and eat slowly. Larynx normal. An ulcerating infiltration of the posterior pharyngeal wall extending just above the plane of the left arytenoid cartilage and also involving the mucosa over the posterior surface of the cricoid plate. Microscope: Squamous epithelioma. Operation by Sir David Wallace, 29th November 1913: removal of a circular tube 2 ins. in length. Patient died one year later with no local recurrence, but the symptoms suggested malignant disease in the thorax with rupture into a bronchus.

CASE V.—Mrs O., aged 53. Difficulty in swallowing for two years, but with choking attacks and occasional difficulty in swallowing for twenty-three years. Normal larynx. Disease involved the lowest part of the post-cricoid space, and the upper part of the cervical œsophagus was adherent to the trachea and the left lobe of the thyroid gland; the latter was removed along with the disease by Sir David Wallace, 3rd December 1913. Case not satisfactory on account of its extrinsic character. Patient died three months later.



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CASE VI.—K. C., female, aged 31. Difficulty in swallowing for more than two years; vocal cord movement unimpaired; swelling of mucosa covering posterior surface of left arytenoid and infiltration of mucous membrane on posterior pharyngeal wall at lower level. Microscope: Squamous epithelioma. Operation, August 1914, by Mr Henry Wade, who made a circular resection of the diseased area. Patient seen fourteen months later without local recurrence. Further history unknown.

CASE VII.—Mrs M., aged 29. Difficulty in swallowing for two years. Larynx normal. A circular area of disease occupied the post-cricoid space, infiltrating the mucous membrane covering the posterior surface of the cricoid cartilage and the posterior pharyngeal wall. Microscope: Squamous epithelioma; 10th September 1917, operation by Mr J. M. Graham. Patient showed no signs of recurrence two years and a half after the operation.

CASE VIII.—E. F., female, aged 37. Complained of difficulty in swallowing for six months; slight swelling of the mucosa covering both arytenoids. The upper edge of the tumour lies across the posterior pharyngeal wall just behind the arytenoid cartilages, and extends downwards behind the cricoid, involving the mucosa covering its surface as well as the posterior and right lateral wall of the post-cricoid space; its lower limitation was the mouth of the œsophagus. Microscope: Squamous epithelioma. Complete excision by Sir David Wallace, 9th October 1918. Six months later the patient was in good health, but her further history has not been ascertained.

CASE IX.—Miss R., aged 51. Difficulty in swallowing for one year. Upper edge of tumour seen in laryngoscopic mirror lying behind the arytenoid cartilages, neither of which is swollen. Mobility of right vocal cord impaired. Operation by Sir Harold Stiles in Chalmers Hospital, May 1919. In order to remove the disease entirely, it was found necessary to excise the larynx at the same time. An œsophageal tube was placed in the upper end of the œsophagus. The patient lived for seven months.

CASE X.—Miss E. W., aged 37. For four years a feeling of constriction in the throat and during the last four months difficulty and pain in swallowing. Larynx normal. Growth visible by suspension laryngoscopy attached to posterior pharyngeal wall. Microscope: Squamous epithelioma. Complete excision by Sir David Wallace; the lower end of the tumour involving the mouth of the œsophagus; œsophageal feeding-tube tied in. Patient alive eight months after operation.

## PELLAGRA

*A Clinical Lecture\* delivered to graduates at the Royal Infirmary,  
Edinburgh, 9th August 1920.*

By EDWARD J. WOOD, B.Sc., M.D., D.T.M.(Eng.)

THE patient, Mrs S., aged 52 years, has lived in Edinburgh continuously for the last thirty years.

There is nothing of note in her family history or her previous medical history until six or seven years ago. At that time she noticed, during the summer season, a redness of the forearms which she attributed to soap and hot water used in her domestic work. This redness was also suggestive of sunburn.

Four months ago she began to notice weakness of the legs which was progressive and which necessitated the wearing of boots with high heels for walking. At this same time erythematous areas appeared on the backs of the hands and forearms and about the neck. Soon after her mouth and tongue became sore and there was a mild degree of salivation. She was sent to the Infirmary two months ago, more on account of the neurological symptoms than for the other disturbances which were never very distressing.

At the present time we find her in bed practically helpless, requiring help to turn over. This weakness is much more marked in the lower extremities.

Mental symptoms are absent. Not even the mild depression, so frequently present early in the course of the disease, has been noted.

The first thing which attracts our attention, and the point on which the diagnosis may be made with comparative safety, is the skin lesion. About each eye extending outward over the upper part of the face are the remnants of an old erythema which was evidently quite mild, leaving behind no pigmentation and, at this time, no evidence of exfoliation. About the neck in front, extending downward over the upper inch of the manubrium, is to be noted a wide band of erythema which gradually narrows from before backward, barely meeting in the mid-line posteriorly. On the lateral aspects will be noted the two pigmented lines indicating the upper and lower margins of

\* The case reported was seen through the courtesy of Dr Edwin Bramwell, and these notes are published with his permission.

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the lesion. These lines, the hyperkeratotic borders of Merk, frequently persist long after all signs of the process are gone and often prove of the greatest diagnostic value. The lesion of the neck is known as Casal's collar, having been described by Gaspar Casal in 1735 in the first definite account of the disease.

On the backs of the hands and the posterior surfaces of the forearms, all the way to the elbows, one finds a definite erythema which is now fading. It is not difficult to recognise the fact that the degree of redness is gradually diminishing. The pigmented borders are not so definite as usually seen when the disease occurs in a warm climate. While pigmentation is usually present its absence should not weaken the diagnosis of pellagra. It will be noted that the erythema extends the whole length of the posterior surfaces of the fingers but the finger-nails are in no way affected.

Examination reveals about the arms evidences of an old erythematous process. During the two months of her stay in the Infirmary she has constantly had a leucorrhoeal discharge due in part at least to vaginitis, which is a common occurrence and which usually attracts little attention owing to its causing the patient comparatively slight inconvenience.

The distinctive feature of the skin lesion which makes the diagnosis comparatively simple is the symmetry in position, in shape, and in size, of the areas involved. In no other condition could bilateral symmetry be better illustrated.

The most instructive feature of this case is the neurological condition. You will note with what difficulty she moves her lower limbs. On examination one finds that she is unable to overcome the slightest resistance to any muscular activity. The examining hand placed on the soles of her feet is much better pushed away than when placed on the tops of the feet. This weakness is present throughout the lower extremities and in a lesser degree in the upper extremities. There is no wrist drop.

The ankle-jerks, knee-jerks, and all the tendon reflexes of the upper extremities are absent. The plantar reflex is flexor. No abdominal reflex is elicited, but the test is of little value owing to the relaxed condition of the abdominal wall.

The pupils react normally to light and accommodation, and there are no ocular palsies.

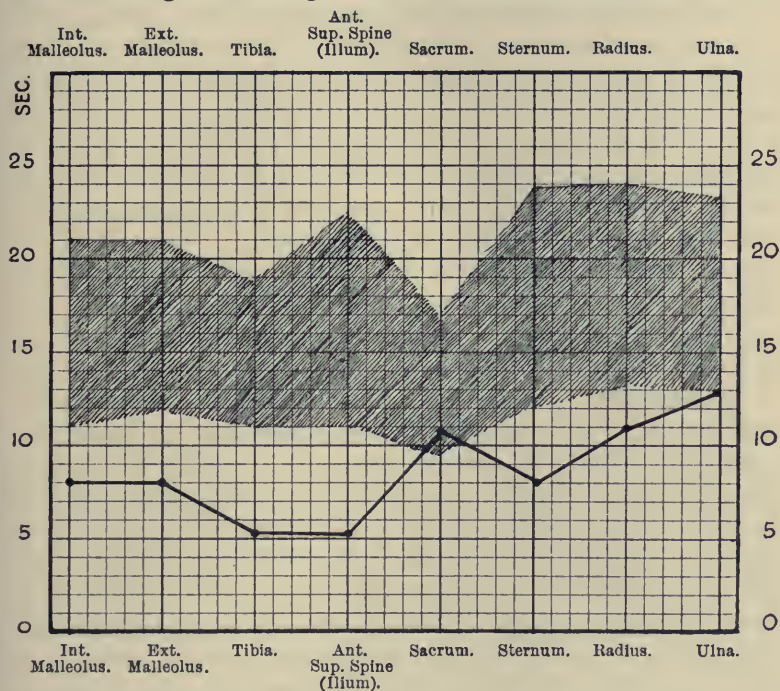
Dr Bramwell was struck with the peculiar quality of her speech, and found that while the soft palate could be raised the



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movement was imperfect and there was a lessened activity of the pillars of the fauces. The quality of the voice suggests such a polyneuritic disturbance as is seen in diphtheria. On questioning the patient it was learned that she experienced some difficulty in swallowing at times but fluid did not come through her nose.

Careful examination of sensation fails to reveal any evidence of disturbance of a gross sort. To touch and to pain there was a perfectly normal response. To heat and cold there was a slight indication of an occasional lack of acute appreciation, but it was too slight to be regarded as of great consequence.



This graph shows the normal range of the time of vibration using a standard vibrator. The heavy line represents the vibration time in the case of pellagra with peripheral neuritis. Note that the time over all points is considerably reduced except over the sacrum. In tabes the reduction would have been as much, or even more, but would have included the sacrum, which would have been the low point—one of the earliest signs of tabes.

I have studied the vibratory sensation with peculiar interest, using a windowed vibrator, described by J. L. M. Symns, which makes quantitative estimation a matter of great simplicity. The time during which the patient was able to feel vibrations of a

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fixed amplitude was recorded in seconds. The bony points selected were the lower parts of the radius and ulna, the anterior superior spine of the ilium, the crest of the tibia, the internal and external malleolus, the sternum and the sacrum. There was a definite diminution of the time response for all bony points except the sacrum. This is illustrated in the accompanying graph. Symns noted that in peripheral neuritis there occurs this shortening of the time over the bony points of the extremities without any alteration of the time response over the sacrum. It is a notable fact that in tabes and in subacute combined degeneration of the cord, while there occurs the reduction in vibratory time over the bony points of the lower extremities, there is also a very definite diminution over the sacrum or even a total absence of any response. Recently in Guy's Hospital I was able to study forty cases of tabes in this way, and in every case there was general reduction of time, with an absence or more marked diminution over the sacrum. I was also able to confirm Symns' observation in peripheral neuritis. This case proves an additional confirmation.

Dr Bramwell finds that to faradism there is a general quantitative decrease and no abnormality to galvanism.

There is some tenderness on deep pressure of the muscles of the calves but it is not a marked feature.

The classification of the neurological condition as peripheral neuritis seems well justified. This is a matter of more than passing interest, for it would have been reasonable to expect a disease picture identical with, or closely simulating, subacute combined degeneration of the cord. Recent confirmation of this is to be found in the work of S. A. Kinnier Wilson. He studied the cord in a number of cases and found pathological changes strikingly similar to that seen in subacute combined degeneration. Looking back over a large series of cases I can see how such a diagnosis fits in accurately with my clinical experience. The blood changes, however, which so frequently occur in subacute combined degeneration are usually absent or very inconspicuous in pellagra. I have never recorded a high colour index in pellagra nor are there any morphological features of the blood suggestive of pernicious anæmia. In this case it is interesting to note:—

(1) This patient has had no diarrhœa at any time during the course of the disease. In a series of 100 cases selected at random from hospital and private practice seventy-seven had

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diarrhœa or gave a definite history of its occurrence earlier in the attack. The diarrhœa often precedes all other symptoms and may have occurred during one or more seasons before the first appearance of erythema. In numerous instances it has been so trifling that only careful inquiry will recall it to the patient's mind. It is frequently attributed to the eating of early spring vegetables. It will be recalled that pellagra is subject to marked seasonal variation. The seasons vary in different climates. In the State of North Carolina (U.S.A.) where my observations were made, the outbreaks begin in May or June though there may be a delay until July. A second outbreak may occur in the autumn though not very frequently. It can often be elicited by careful inquiry that for one season or even for several seasons at the time of the year which will later be the period for the appearance of the erythema, there have been attacks of diarrhœa and vague digestive disturbances. It is probable that if a careful search could be made at the time of these vague symptoms inconspicuous areas of erythema would be discovered.

The time of the appearance of an outbreak will vary in the same locality from year to year depending apparently on the nature of the season; if the warm weather is late in appearing it is expected that the fresh outbreaks and the new cases will be delayed.

(2) This patient has been only slightly annoyed by salivation. It is often a most distressing symptom. It is no uncommon sight to find a patient lying with the head turned to one side and a vessel placed at the angle of the mouth to catch the saliva. There is a constant trickle of saliva which may continue for long periods. Expectoration and even swallowing are quite painful owing to the condition of the mucous membrane of the mouth and pharynx. In my series the mouth symptoms occurred in seventy-three cases. The degree of inflammation of the tongue and buccal mucous membrane varies greatly. It may be so slight that the patient will not complain. Ulceration about the edges of the tongue frequently occurs and ulcers may also be found beneath the tongue.

(3) The skin lesion in this case is quite typical. In many cases the extent of the skin involvement is much less, while in others it may be much more. Pigmentation is not a notable feature in this case. It is frequently too greatly emphasised in the literature as a distinctive feature of pellagra. Its occurrence



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seems to depend on the degree of sunlight and the amount of natural pigment of the skin affected. In the negro the pigment is quite black in appearance and is often a striking feature. In the mulatto, while not so deep a colour, it may be much more striking by contrast. In this case there is little pigmentation, and what is present is light in colour, and occurs only in streaks marking the borders of the lesions as above noted.

In ninety-seven cases of the series of a hundred, the skin of the backs of the hands or the forearms, or both, was affected. The backs of the hands and the lower third of the posterior surfaces of the forearms are so frequently affected in pellagra, that many fall into the evil custom of searching only this part for the lesion in suspected cases, and if not found the possibility is dismissed. The whole skin surface should be carefully inspected in doubtful cases. This is especially important in elderly people, who live indoors, seldom coming in contact with direct sunlight. I have in mind an old woman who had suggestive symptoms but no apparent erythema. On making a rectal examination a perianal lesion was discovered. Such doubtful cases, when placed out in the sun, will frequently develop the complete picture. My interest has recently been attracted to the skin lesions of the covered portions of the body. It is, of course, generally recognised that the uncovered portions are more frequently affected, but it is quite essential to recognise the possibility of occurrences elsewhere. I have found perfectly symmetrical lesions occurring about the vulva in a number of instances, and pigmentation was a marked feature in some of them. The lesion in this location is frequently overlooked because it causes so little discomfort. In a recent case I noted the skin lesions at the following points: backs of the hands and forearms, neck, face, upper surfaces of the toes, external malleoli, internal malleoli, areas on the legs, just below the patellæ, areas in the popliteal spaces, areas about the vulva, and seven or eight rounded areas exactly in the mid-line over the prominent points of the vertebræ, beginning above at the vertebra prominens. In every instance the size, shape, and location of these areas showed almost perfect symmetry.

In thirty-nine cases of the series, the hands and forearms alone were affected; in ten cases the hands only; in five cases the forearms. In sixteen cases the feet were affected in combination with some other location. Children going with bare feet and legs were frequently affected on these parts. It

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was remarkable how slight the other symptoms of pellagra were in some of these cases, while in not a few the skin lesions were the only sign of any disturbance. In many instances the skin lesion extended upward over the calves with marked pigmentation. As a rule children suffer much less from pellagra than do adults. Even in the absence of all other symptoms we felt quite confident in the diagnosis of pellagra in such cases, owing to the character of the skin lesion: exact symmetry, the locations of the lesions, more frequently than in adults, were those parts exposed to the sun.

(4) Mental disturbances frequently occur in pellagra. It is important, however, to rid one's mind of the old idea that insanity is an essential feature. Many cases never show the slightest indication of mental symptoms. Some cases have existed for a number of years before the first indication of mental change. With the increased knowledge of the etiological factors and the preventive treatment based on such knowledge, it is to be expected that the incidence of mental symptoms will be materially reduced. It becomes, then, a problem of vital importance to detect all cases early, and correct the underlying dietetic fault, thereby curing the patient before mental changes occur, or before a toxæmia of sufficient degree can be established, for many of the mental symptoms must be regarded as a toxæmia without organic change, and, indeed, it is believed by the majority of observers that this class would include all cases. At this time it is estimated that 40 per cent. of the victims of the disease manifest mental symptoms. Usually these symptoms appear after the disease has existed for some time. This is not, however, invariable. I recall one of my earliest cases which manifested mental symptoms months before the first signs of erythema. The mental picture is always one of great depression. Mild delirium, much as one would expect in the terminal stage of subacute combined degeneration is frequently noted. To it is added loss of sphincter control, refusal of food, and great restlessness. Many cases without sphincter disturbance become exceedingly untidy, emptying rectum and bladder in bed or about the room in which they sleep with utter indifference. Should recovery occur, the mental symptoms subside with general improvement. When a case reaches such an advanced stage, however, the outlook for improvement is poor.

During the past decade a tremendous amount of work has

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been done in the study of the etiology of pellagra. While there are still many differences of opinion the indications point to an early general acceptance of a dietetic source. It is true that the idea of infection is still held by many whose opinions carry so much weight that their views cannot be ignored or passed over lightly. One able group of observers regards it as an infection, the transmission of which depends upon faulty sewage. Dr L. W. Sambon considers it an infection of unknown nature transmitted by some biting fly as a similium or a culicoides. This theory is still held by him in spite of the failure of confirmation.

Dr Joseph Goldberger of the United States Public Health service summarises his epoch-making work by the conclusion that pellagra is of dietetic origin; that it depends on an undetermined error in which there is a disproportionately high vegetable component and a disproportionately low protein component derived from animal or leguminous sources; that the disease never develops in those eating a well-balanced diet suitably varied. Time prevents a full consideration of this important contribution. I can only cite one striking instance of the value of his work. In 1913 he found an orphanage with 75 per cent. of the children pellagrins. The children escaping the disease were the younger ones whose diets were supplemented with fresh cow's milk. After a year of his diet reform among the 234 inmates not a case occurred. In another experiment he produced the disease experimentally in a group of prisoners. Finally, to a squad of volunteers he gave by mouth fæces of pellagrins without producing any disease condition.

Dr W. H. Wilson in Cairo regards pellagra as due to a defective protein supply in the diet. He first directed attention to the biological value of protein in the diet. He found that the biological value of protein from vegetable sources, notably from maize, was less than that from meat or milk protein. He concludes that the disease is prone to occur when the biological value of the protein of the diet fell below a certain point.

Dr F. D. Boyd and his co-workers in Egypt found that the level of biological protein could be so exactly determined that it was possible to anticipate the disease. One of their most important findings was that a rest diet was inadequate in protection against the disease when the patient was put to work as a labourer. Diarrhœal diseases were regarded as playing an



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important part in the causation of pellagra, and that among the Turkish prisoners studied the absorption of protein was less than 67 per cent. Metabolism experiments showed a low degree of assimilation of both fat and nitrogen.

My own work on the etiology of pellagra was done in the State of North Carolina (U.S.A.) when the chief cereal food of the class suffering most from the disease was maize or Indian corn. Prompted by the experience of P. A. Nightingale (*Transvaal Medical Journal*, 1912), I undertook the study of the milling of the grain as a possible source of a deficiency. It will be recalled that the germ of maize lies poorly covered at the hilus of the grain. It is quite soft, while the remaining endosperm is almost flinty in hardness if properly matured. Owing to the softness and the vulnerable situation the germ is subject to the greatest damage from both animal and vegetable parasites. Too early gathering of the crop before thoroughly dry, storage in a damp place or without proper regard to ventilation, and the presence of such agents as moulds, fungi, and mites all play a part in damaging the grain. The germ by chemical analysis was found to contain the vast bulk of phosphoric acid ( $P_2O_5$ ). It will be recalled that in the beriberi work in the Philippines phosphoric acid was found to be a reliable indicator of the essential substance which is commonly called by the name vitamin, a chemical misnomer which should be abandoned. It will be recalled that in different grains the essential substance is differently distributed. In rice, by the process of polishing, it is removed and can be recovered from the polish. In wheat it is also to be found in the cortical portions.

It was found that in the commercial maize mills, the grain is "degerminated," that is, the germ is removed before grinding. The reason for this is, that the germ contains such a large proportion of oil that when ground with the grain the meal so soon becomes rancid that great loss results.

Our chemical analysis showed that when the grain was ground *in toto* with no removal the  $P_2O_5$  was 0.78 per cent. The commercial germ product mixed with much bran contained 1.15 per cent.  $P_2O_5$ , while for experimental purposes we were able to secure a product with a  $P_2O_5$  content of 2.0 per cent. On the local market where the experiments were made a favourite brand of maize meal was selected in order to determine what the people were really consuming. This product was found to contain 0.29 per cent.  $P_2O_5$ .

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It will be recalled that it was shown in the beriberi work that the addition of sodium bicarbonate to food in the process of cooking resulted in a decidedly deleterious action on the essential substance.

With this chemical data before us we experimented with chickens and pigeons, repeating the rice experiments in the production of polyneuritis gallinarum. In a word, it was found that "degerminated" maize meal caused the same type of polyneuritis which had been produced by beriberi and was relieved by the germ of the maize just as rice polish had relieved it. All grades of maize, using  $P_2O_5$  as the indicator, were experimented with using controls in all instances. It was found that if the food given contained a decreasing amount of  $P_2O_5$ , the birds might escape polyneuritis, but the young hatched from eggs laid during the experiment became polyneuritic promptly. While polyneuritis did not occur, there was noted a condition characterised by red legs, droopiness, loss of feathers, and loss of weight. We were disposed to believe that this condition was due to a deficiency of the same character as that in polyneuritis gallinarum, but of a lesser degree. We are not prepared to state that it is the analogue of pellagra as polyneuritis gallinarum is of beriberi, but the data was of great practical help in the treatment of pellagra.

Assuming that pellagra was due to a deficiency brought about by this method of milling maize, I undertook to try the effects of feeding the germ of maize to the victims of the disease. The first case was an elderly man with typical pellagra. At the time of the experiment there was a well-marked erythema and a troublesome diarrhoea of several months' duration. The plan of the experiment was explained to him and he was pleased to co-operate. After five days of an exclusive diet of maize germ, with a small portion of butter and no other food, the erythema cleared up, the diarrhoea terminated, and he left the hospital asking for a purgative. I have kept in touch with him for several years and he has suffered no recurrence.

It was early appreciated that just as pellagra may occur in those who have never eaten maize, so a deficient wheat should be suspected as readily as a deficient maize. When the bran and cortical portions of wheat were used, the result was as pleasing as with the germ of maize.

The second case was a negro woman in the last stages of the disease. There was delirium and incontinent bowel and

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bladder. The patient would not eat, and was fed by the tube. At each feeding she was given a pint of milk, two eggs, and one or two ounces of sugar of milk. There was no improvement from this until half a pint of a gruel made from wheat, bran, and cortex was added. The result was immediate. The delirium subsided, the diarrhoea improved, and the patient began taking her food. Unfortunately she succumbed to the sudden death so common in my experience.

How much can be expected from this plan of treatment remains to be proven. It is as obviously unfair to expect any decided improvement after structural change has occurred as it is to expect to cure the epiphyseal hæmorrhage of scurvy, which has already occurred, by orange juice.

I am convinced that abundant protein feeding with properly cooked fresh meat, fresh milk, and eggs is the ideal treatment for pellagra. Unfortunately, such treatment is not within the reach of the starving races of the earth, and if such a simple and inexpensive expedient as the feeding of the so-called "offal" of the mills will cure the early case and a reform in milling and cooking will prevent it, the problem becomes one of practical solution.

In the meanwhile we should as near as possible see that our patients are put to rest in bed and are given a diet containing abundant protein, preferably of animal origin, that whole wheat flour and maize, ground without any part removed, are used rather than the highly "patent" product so popular with the housewife because of its beautiful white colour, and that sodium bicarbonate and baking powders are avoided in the cooking. Whether the deficiency is one of the Water-soluble B or the Fat-soluble A or both, remains unproved. Contrary to general opinion I am disposed to suspect the deficiency in Water-soluble B as in beriberi, though it may be that the germ of maize and the cortex of wheat contain something more than this to which their value in pellagra is due.

The prognosis of pellagra is one of the difficult features. Sudden death even in children has occurred repeatedly in my experience. I have seen death occur in a condition closely simulating the Stokes-Adams syndrome, though the duration of the final scene was too short for full investigation. If the diagnosis is made early and proper dietary treatment instituted with the co-operation of the patient, recovery is to be expected. In the fulminating cases so frequently seen in the early



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American cases, the prognosis is almost as unfavourable as in acute miliary tuberculosis, the disease running a course of from six to twelve weeks.

In conclusion may I add that several cases of pellagra have occurred in Edinburgh, several in the Shetland Islands, and at least one in the Orkney Islands. Dr Sambon has reported 180 cases in Great Britain and more have been reported since then. If pellagra is occurring the reasonable assumption is that the dietary, especially of the poor, should be carefully studied and watched.

In no branch of medicine in recent times has such progress been made as in the study of nutrition and nutritional diseases. A careful consideration of this phase in every case coming to us would tend to prevent much later trouble. In America it took us a long time to appreciate this. It is to be hoped that you may profit by our experience and be spared the distress which pellagra as a national problem always entails.

# THE CLINICAL FEATURES, ETIOLOGY, AND TREATMENT OF INFLUENZA.

By WILLIAM D. D. SMALL, M.D., F.R.C.P.E.

(Continued from page 33.)

## (C) PATHOLOGY AND BACTERIOLOGY.

### *Post-mortem Examination.*

THE post-mortem findings may be summarised by giving in brief an account of the examination of three cases of different types, and then by shortly stating variations noted in other instances.

CASE I.—Male, aged 23. Fulminant type of influenza. Death in eighteen hours. P.M. fourteen hours after death.

*Clinical History*—25/4/18.—Admitted with slight impetigo, otherwise in perfect health; strong and powerfully built.

27/4/18.—Went to concert for troops. Quite well.

28/4/18.—Rose at 6 A.M. and made his bed. Then complained of not feeling well, and was allowed to go back to bed. When seen at 10 A.M., complained of pain in chest, and had some sputum which was frothy and blood-tinged. Was obviously very ill, and had intense odour like that of decomposition. Respiration rapid and laboured; temperature 103° F.; pulse 118; colour, bluish. His condition became progressively worse during the day, and by 5 P.M. the temperature was 105° F., the pulse 130, irregular and extremely unstable, and the respirations 54. The appearance was one of intense toxæmia, and the colour a deep greyish-blue. Was too ill to feel very uncomfortable, and made no complaint. Examination of the chest showed harsh breath sounds, and numerous ronchi and coarse crepitations. There were no signs of consolidation. Did not respond to free stimulation, and died just before 12 midnight.

*External Appearance.*—Colour intensely blue and toxic looking. Marked lividity of dependent parts. Much frothy fluid exuding from nostrils. Rigor mortis well marked. Body that of a man of exceptional muscular development.

*Internal Examination.*—Veins of neck much distended. Blood dark in colour and very fluid. Nothing to note in subcutaneous tissues or muscle.

*Lungs.*—Trachea and bronchi congested; congestion most marked in smaller bronchi. Slight recent fibrinous pleurisy. Each pleural cavity contains a few ounces of fluid. Both lungs show intense

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congestion and œdema; much frothy fluid exudates on section. Congestion and swelling of bronchial mucous membrane.

*Heart*.—Blood dark and fluid. Cavities and valves normal. No apparent change in heart muscle.

*Spleen*.—About three times normal size; very friable, shows great congestion.

*Liver and Kidneys*.—Show marked acute congestion.

*Microscopic Examination*.—Lungs show much congestion, bronchitis, and many patches of early bronchopneumonia. Spleen markedly congested with great dilatation of blood spaces.

*Cultures* made from the heart blood gave a pure growth of pneumococcus.

CASE II.—Male, aged 25. Influenza with bronchopneumonia and acute nephritis. Death on fifteenth day. Post-mortem fourteen hours after death.

*Clinical History*—9/5/18.—Taken suddenly ill. Complaining of feeling of chilliness, pain in body and limbs, and severe headache. Slight cough. Temperature 101.4; respirations 30; pulse 100.

10/5/18.—Colour dusky. Face puffy. Respiration laboured and distressed. Many râles heard through chest. Sputum frothy and slightly blood-stained. Urine diminished; contains much blood, albumen, and epithelial casts. Temperature 104.4; pulse 140; respirations 40.

17/5/18.—Colour greyish-blue. Has been running course of an acute bronchopneumonia with much toxæmia. Signs throughout chest those of bronchitis and bronchopneumonia, with friction more or less general over both lungs, especially the left. Pulse is very unstable. Amount of blood in urine is diminishing.

22/5/18.—During the last four days has suffered from severe uncontrollable diarrhœa. Culture of stools negative to typhoid-dysentery group. Died at 11 A.M. from intense toxæmia, with respiratory embarrassment and cardiac failure.

*Post-mortem External Appearance*.—Deep greyish-blue colour. Frothy fluid exuding from nostrils. Rigor mortis commencing.

*Internal Examination*.—Much distension of veins of neck. Blood dark and fluid. Subcutaneous fat scanty. Muscle shows no naked-eye change.

*Lungs*.—About 10 ounces of fluid in right pleural cavity—slightly purulent. Both lungs show recent fibrinous pleurisy, causing adhesion to parietal layer, and between lobes. Lungs intensely congested, and on section much frothy, purulent, and blood-stained fluid is exuded. Patches of bronchopneumonia and of collapse through both. Bronchi are acutely inflamed. Some small peribronchial abscesses.



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*Heart*.—Muscle pale and soft. Acute myocarditis. Right heart is dilated.

*Spleen*.—Enlarged to twice normal size, very soft, intensely congested.

*Liver*.—Congested. Shows cloudy swelling.

*Kidneys*.—Increased in size to about  $1\frac{1}{2}$  times normal. Capsule strips easily. Consistence somewhat lessened. Intensely congested. Cortex is widened, but no sharp line of demarcation between it and medulla. Acute nephritis.

*Gastro-intestinal Tract*.—Apparently normal.

*Microscopic Examination*.—Lungs show bronchopneumonia and marked bronchitis. Kidneys show acute tubal nephritis. Epithelium of tubules shows cloudy swelling and granularity of cells. Tubules filled with desquamating and degenerated cells. Glomeruli only very slightly affected. Liver shows cloudy swelling, and slight fatty degeneration in places. Heart shows acute myocarditis. Spleen shows congestion and dilatation of blood spaces.

CASE III.—Male, aged 29. Influenzal pneumonia. Death on third day. Post-mortem twelve hours later.

*Clinical History*—25/5/18.—Admitted from local training school with symptoms of severe influenza. Marked signs of severe bronchitis present from commencement. Toxic appearance. Temperature; 102.2. pulse 104; respirations 30.

27/5/18.—Has well-marked signs of consolidation of the whole of the right lung. There is also some fluid in the pleural cavity. On the left side there is a large acute pleural effusion. Friction is heard over the whole of the right lung, and over the upper part of the left in front. Sputum is frothy and blood-stained. Patient is very cyanosed, and respiration is rapid, shallow, and difficult. Respirations 48; pulse 144; temperature 104. Fluid aspirated from left chest is very slightly purulent, and contains immense numbers of streptococci. Patient died rather suddenly from heart failure about 11.30 P.M.

*Post-mortem External Appearance*.—Body slightly emaciated. Toxic and cyanosed appearance. Post-mortem rigidity well marked. Lividity of dependent parts.

*Internal Examination*.—Subcutaneous fat scanty. Muscle appears normal. Hæmorrhages on the under surface of rectus muscle. Veins of neck engorged; blood very fluid and dark.

*Lungs and Pleuræ*.—Considerable amount of fluid in both pleural cavities. Left contains about 30 ounces; right about 12 ounces. Acute recent pleurisy over anterior surface of right lung, which is adherent to the chest wall. Adhesions most marked over the upper lobe. Pleura also adherent to diaphragm. Slight adhesions between both pleuræ and pericardium.

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*Right Lung*.—Surface covered with recent acute pleurisy, including diaphragmatic surface. Lobes adherent, due to recent pleurisy. Surface of lung mottled and resembling red marble. Upper and lower lobes entirely consolidated, middle lobe consolidated at upper and outer end. Larger bronchi acutely congested. Small amount of frothy fluid exudes on section.

*Left Lung*.—Lower lobe consolidated, and similar in appearance to that of right lung. Bronchi contain some purulent fluid. Upper lobe intensely congested but not consolidated.

*Trachea*.—Contains small quantity of frothy, blood-stained fluid. Mucous membrane congested. Larger bronchi acutely inflamed, and contain frothy, blood-stained fluid.

*Thyroid*.—Appears normal.

*Pericardium*.—Outer surface somewhat injected. Slight adhesions between pleuræ. Small quantity of lymph on surface. Pericardium contains about 3 ounces of dark coloured fluid.

*Heart*.—Muscle pale. Right ventricle thin and dilated. Both sides contain dark blood-clot—especially left side. Valves competent.

*Spleen*.—About twice normal size. Congested. Malpighian bodies not conspicuous. Soft. A few small hæmorrhages under capsule.

*Liver*.—Slight degree of cloudy swelling, and slight fatty change.

*Kidneys*.—Considerably enlarged. Capsule adherent all over. Stellate veins prominent.

*Culture*.—Cultures from the heart blood and spleen gave a pure growth of a long chain gram positive streptococcus. This organism was also isolated pure from the fluid in the pleural cavities, and was obtained from the lungs along with staphylococci and pneumococci. It was found in large numbers in the sputum before death.

### **Summary of More Important Post-mortem Findings.**

The foregoing accounts of individual post-mortem examinations may be taken as typical of the majority of cases. It may be convenient, however, to summarise the findings in a more general way, and to indicate their relative frequency and importance.

The external appearance was almost invariably indicative of intense toxæmia. The colour was dusky or livid; the odour was often intense just as had been noted in many of the severe cases previous to death. The dependent parts showed marked discoloration. Rigor mortis followed the normal course.

The subcutaneous tissues showed no particular change, but in the more prolonged cases, they might show diminution in the amount of fat. The muscles usually appeared normal, but might be pale, and in several instances the rectus abdominis

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showed hæmorrhages under its sheath or into its substance. The large veins of the neck were uniformly distended. The blood was always dark and very fluid.

The larynx was slightly congested. The trachea was usually inflamed, the degree of injection becoming gradually more marked towards the lower part. General acute bronchitis was constant, the smaller bronchi showing the greater degree of change. Œdema of the lungs was extremely common. Broncho-pneumonia—either scattered or confluent—was by far the commonest of the more serious pulmonary lesions. Lobar pneumonia was also found in numerous instances, usually in the stage of red hepatisation. A general purulent infiltration of the lungs, small peribronchial abscesses, or minute areas of necrosis might accompany other changes, though no case of a large abscess or of actual gangrene was observed. Fibrinous pleurisy was almost invariably found. A small quantity of fluid in the pleural sacs was common, but only in one instance (Case 3, previously mentioned) was there a large effusion. The fluid was usually slightly turbid, and might contain pus in larger amount.

Pericarditis was rare, being seen only in two instances, and in one of these it was very slight. In both it appeared to result from spread from a neighbouring acute pleurisy. The pericardium frequently contained two or three ounces of fluid. The heart muscle often appeared normal, but in a number of cases it was pale, and there was evidence of acute myocarditis. No case of acute endocarditis was observed. The blood contained in the heart was in the great majority of instances dark and fluid. In a very few cases it was clotted.

The spleen was invariably enlarged, in many cases to three times the normal size. It was intensely congested, and showed marked dilatation of the blood spaces. In one instance only there were hæmorrhages under the capsule. The consistence was very soft, and it was so friable as to be easily torn in removal.

The liver showed intense congestion, and commonly some degree of cloudy swelling. There was not infrequently some early fatty degeneration.

The kidneys in some cases were acutely congested, and might show cloudy swelling. In a few instances there was acute nephritis, the changes being seen with much the greatest intensity in the tubules. The glomeruli were only very slightly affected. In one case only, there was a small abscess of the



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kidney, about the size of a hazel-nut. No case of perinephric abscess was observed, but attention has recently been called to this complication or sequela.

The thyroid appeared congested; the suprarenals did not show any changes of note.

The brain was only examined in some four cases. In two of these there was considerable œdema. In one other, there was a widespread purulent leptomeningitis, particularly at the base of the brain and in the region of the cerebellum. The case, however, was one in which there was a head wound, and the finding therefore cannot be regarded as attributable to influenza alone.

*Conclusion.*—The changes found post-mortem in influenza are those of a general septicæmia. The virus invariably shows its action to be most marked upon the respiratory system; it also exerts a profoundly toxic action upon the heart, and upon the kidneys.

*Bacteriology.*—The amount of time required for extensive bacteriological investigation was quite unobtainable during the period of stress occasioned by the epidemic. The findings, however, in such investigations as could be satisfactorily carried out were briefly as follows:—

*Blood Culture.*—In six cases, blood obtained with all aseptic precautions from the median basilic vein was used for culture. In each instance about 3 c.c. was incubated in trypsin broth, and a similar amount in 2 per cent. glucose broth. The blood was also spread upon agar plates of suitable reaction. In no instance was any growth obtained. In view of the uniformly negative result, and also that the taking of the blood seemed to upset the patients considerably—especially causing extreme acceleration of the pulse-rate—the method was not continued further.

*Examination of Sputum.*—This was carried out by means of (a) direct films stained by either methylene blue or weak carbolfuchsin, Gram's stain, and Muir's capsule stain; and (b) cultures on hæmoglobin-agar plates.

In direct films, the organism most constantly found—so constantly in fact as to be almost invariably present—was a diplococcus, morphologically resembling the pneumococcus, and in the majority of cases showing capsules. There was considerable variation in the size of these cocci, and also in their form. Many were larger than normal, and large oval or lancet-

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shaped forms might be seen. The first impression obtained from the examination of films was that the pneumococcus was the predominant, and probably therefore the most important organism present, but further investigation by various workers soon showed that this was incorrect, and that in reality many of these cocci belonged to the streptococcus group. True pneumococci, however, appeared to be present in a considerable proportion of the cases, particularly early in the first wave of the epidemic. The majority of the streptococci isolated proved to be members of the *S. viridans* group, but in a number of cases a very long-chain hæmolytic streptococcus was obtained. In some of these, long chains of the organism could be seen in direct films of the sputum. Most of the streptococci which were cultivated showed great pleomorphism, and here and there some of the elements appeared so elongated as almost to resemble bacilli.

In the cases examined in the first three weeks of the epidemic, Pfeiffer's bacillus was not obtained in a single instance. This was not an isolated finding, but was similar to the experience of other laboratory workers in the same district. Later in the epidemic, its occurrence was frequent. It should be noted that the technique employed was the same throughout. The organism was generally most readily found on the plates in the neighbourhood of colonies of the *Staphylococcus aureus*. This absence of the influenza bacillus in the earliest period of the epidemic would seem to weigh against the view that it is the primary causal organism of influenza. Its frequent presence in other fevers has also been recognised.

Amongst other organisms commonly found, the *Staphylococcus aureus* appeared to be of some importance, first from its frequency, and secondly from its symbiotic relationship with the influenza bacillus. Numerous gram-negative cocci, some of which were of unusually large size, were also common. Large spirochætes of the Refringens type were observed in a considerable number of the films, but examination of a large number of sputa from general medical cases showed that their presence was not by any means uncommon. *Micrococcus tetragenus* and the pneumobacillus were occasionally seen. The frequency with which the different kinds of organisms were isolated appeared to vary both with the type of case from which the material was obtained, and also with the particular period of the epidemic at which the observations were made.

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*Cultures from Internal Organs in Fatal Cases.*—In one acute septicæmic case, the pneumococcus was isolated pure from the heart blood.

In two instances, the large chain hæmolytic streptococcus was isolated from the spleen and from the heart blood. In one of these cases it had been noted in exceptional numbers in the sputum before death, and was also cultivated from pleural fluid withdrawn by puncture the day previously. Immense numbers of the organism could be seen in directly stained films of the effusion. In two other instances streptococci were also obtained from the heart blood, and in one of them also from the spleen. That obtained from the heart blood alone rapidly died out on culture, and was therefore incompletely identified. The other appeared to be the *S. faecalis*.

*Conclusion.*—The *B. influenza*, various streptococci, the pneumococcus, and the *Staphylococcus aureus* all appear to play a part in producing the syndrome clinically known as influenza. The precise rôle of each is as yet uncertain, and the primary cause of the disease is at present undetermined.

### (D) IMMUNITY.

Clinically, no immunity to influenza appears to be conferred by a previous attack: indeed once an individual has been affected he seems to be rendered more liable to contract the disease upon a subsequent occasion. Nor in these circumstances does the later attack seem to be less severe, but experience of the 1918 epidemic showed rather that each succeeding infection was of a more virulent type than its predecessor. Examples of second or third attacks were quite common, and there were numerous instances of the same individuals being admitted for influenza in both the first and second waves of the epidemic. In about three instances, a second attack was developed in hospital within a month from the onset of the first. One attack of influenza therefore may be regarded as potently predisposing to subsequent infection, and clinically no immunity of any kind—even transient—appears to be conferred by the disease.

In this connection it seems rational to consider the practice of preventive inoculation. In view of the fact that the natural disease confers no immunity, it does not appear reasonable to expect that the artificial inoculation of the virus can do so. Admittedly the part played by the various organisms identified



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is as yet incompletely determined, and therefore any method of inoculation can at best be regarded only as experimental. The most that is usually claimed for the procedure as at present practised in influenza, is that it may in some measure diminish the liability to those complications which result from the pathogenic activity of the pneumococcus and the streptococcus. Such opportunity as was afforded of testing the efficacy of a prophylactic vaccine did not yield much encouragement. In common with other formations, approximately one half of the hospital personnel were inoculated with the vaccine at that time prepared by the R.A.M.C. laboratories, and officially issued for use among the troops. Two injections were given at intervals of ten days. The other half of the unit was uninoculated. The number of cases of influenza that occurred in each group was

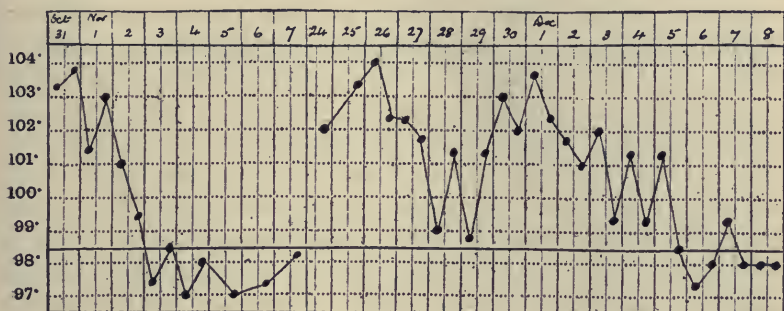


FIG. 9.—Chart showing two infections of the same patient within a month.

about equal, and it was not found that those who had been inoculated contracted the disease in any milder form than the others. It must, however, be admitted that nearly all the cases in both groups were not severe. In the particular case of one medical officer who contracted influenza about five days after his first dose of vaccine, it almost appeared as if the attack had been rendered more intense. Whether or not that was so, the type of illness was certainly extremely acute, and the toxæmia and prostration both exceptionally pronounced. This and one or two similar cases raise the question as to whether the practice of preventive inoculation is advisable in the case of individuals who during the period immediately following are to be constantly exposed to infection, in view of the fact that during the negative phase—if there be one—the degree of susceptibility is increased.

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## (E) TREATMENT.

During the first wave of the epidemic, when the prevalent type of influenza was relatively mild, and with the disease tending towards a naturally favourable termination within a few days, treatment was of relatively little importance. With the advent of the much more virulent influenza of the second wave, it became at once evident that the relative mortality would depend very largely upon the management of the cases, and that it was eminently desirable, if possible, to find some method of treatment which would control or cut short the course of the disease. The immense number of cases to be dealt with also rendered it essential that for any method to be of service in the then prevailing emergency it had to be simple and readily carried out.

Under the method of treatment which was adopted, the deaths numbered 28 out of 986 cases admitted to hospital during the October-December wave of the epidemic, thus giving a mortality of approximately 2.8 per cent. This figure is extremely low in comparison with many other of the recorded results, and particularly so when it is remembered that it includes all the cases complicated by bronchopneumonia. The mortality officially stated to have occurred amongst all cases of influenza in the British Expeditionary Force, France, during the same period is 6.2 per cent.<sup>1</sup> Towards the favourable result obtained there were a number of contributory factors. The conditions prevailing at the hospital were exceptionally favourable; all medical comforts could be readily obtained; and the wards set aside for the treatment of the influenza cases were particularly large and well ventilated. The only disadvantage was the shortage of staff, owing to the exceptional exigencies of the period. Most of the cases were admitted from local units, and had no great distance to travel in order to reach hospital. The majority therefore were admitted early, and escaped the harmful effects of a long journey, for it soon became evident that influenza cases travel very badly, and "distance from hospital" influenced very distinctly the prognosis. These factors undoubtedly contributed to the low rate of mortality, but since the death rate was considerably higher in other hospitals which were equally favourably placed, it would appear that the method of treatment—and particularly the use of gelsemium—played no unimportant part.

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The treatment adopted as a routine may be outlined as follows:—

*In the acute stage* the **general management** is similar to that of a case of pneumonia. The patient should be at once put to bed, and absolute **rest** must be maintained. He must be disturbed as little as possible by examination—in fact, the less he is examined the better. Although, admittedly, there may be exceptions, essential changes in the chest can usually be made out with the patient lying on the back; he should never be allowed to sit up, but if necessary may be carefully rolled over on to his side, in which position he is, if need be, supported. Examination is usually more of academic than of practical importance in these cases, since treatment is determined rather by the general condition of the patient than by any local pathological lesion. The rare occurrence of acute pleural effusion must be regarded as the most important exception to this rule. **Fresh air** is of paramount importance, and ventilation should be so free as practically to amount to treatment in the open. There is no more suitable ward than the large army Adrian hut, provided all the doors and windows are kept constantly fully open. Measures must, however, be taken to ensure that the patients are kept sufficiently warm, and an adequate supply of blankets and hot bottles should be provided. On the other hand, overheating must be carefully avoided, as restlessness is thereby produced, and this is apt to be followed by sleeplessness and its concomitant dangers. The **diet** should consist mainly of fluids—milk, beef-tea, clear soups, beaten-up egg, weak tea or coffee—and in suitable cases, custard, curds, and jellies. With the object of reducing or preventing toxæmia, free **elimination should be promoted**. The patient should be encouraged to drink large quantities of water, barley- or lemon-water, or imperial drink. A mild diuretic, such as citrate of potash, may also be given. Aperients should be used with caution, owing to the danger of producing diarrhœa, for, as already pointed out, this proved a very troublesome and serious complication in some of the severer cases. For this reason, enemata are distinctly safer for routine use.

**Medicinal Treatment.**—At the commencement of the second wave, investigations were carried out by W. O. Blanchard and myself, with the object of determining the relative value of certain likely remedies. These have been fully detailed in a previous article.<sup>2</sup> The method adopted was to put groups of patients



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upon different drugs, and to note and compare their progress. For the initial experiment fifteen patients constituted each group, and eight of such groups were treated with different remedies. The cases were entirely unselected, the remedy for each being only determined by the number of the bed; *e.g.*, those in beds 1 to 15 came under one method, numbers 16 to 30 under another, and so on. These comparative methods of treatment were carried out, because from our experience in the first wave of the epidemic, we were not satisfied that any of the usual remedies that had been employed had in any way influenced the course of the disease. Among those thus tested was gelsemium, to whose action in influenza the attention of one of us had first been directed in 1913 by an article of Ellingwood's.<sup>3</sup> Briefly stated, the result of our observations was to show that the cases treated with this remedy improved in a manner far exceeding those who were given any other drug. After a few doses, there was commonly-marked betterment, the symptoms—especially headache and backache—were relieved, the general condition appeared better, and in most the temperature soon commenced to fall. Being aware of the difficulties and fallacies attendant upon the estimation of the relative action of remedies, we endeavoured very critically to confirm or disprove our original observation, and with that object repeated the test upon a large number of cases. The value of gelsemium was to our mind conclusively demonstrated, and there appeared to be no doubt that not only does it afford much relief to the patient, but that it materially shortens the period of illness. All our cases were thereafter put as a routine upon moderate doses of gelsemium, the actual prescription employed being—

R̄

Tr. Gelsemii . . . .	℥ xij.
Tr. Belladonnæ . . . .	℥ v.
Potass. Citratis . . . .	gr. x.
Syr. Aurantii . . . .	ʒj
Aq. Chloroformi . . . .	ad ʒj

Sig.

One ounce every four hours, for the first twenty-four hours ;  
thereafter half an ounce four-hourly until the temperature  
is normal.

The remedy should be discontinued after the temperature has reached the normal. In a very small number of cases, the use of gelsemium was attended by slight ocular disturbances, and if

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too long continued it may give rise to mild head symptoms. No other disadvantages were noted in the large series in which it was used.

In many of the severe cases stimulants are urgently required and should be given in large doses. Alcohol, either as whisky or brandy, gives the best results, and may be administered in doses of half an ounce to an ounce, every four hours or oftener if the case be urgent. The main indications are collapse, tremor, toxæmia, marked pulmonary symptoms, and signs of cardiac failure. Digitalis proved useful when cardiac stimulation was specially required, and aromatic spirits of ammonia was also of value. Other stimulants did not seem to be of much service in cases of influenza, and in particular strychnine appeared not to exert its usual action.

**Treatment of Complications.**—The treatment of pulmonary complications calls for no special discussion, as it is determined by the requirements of each individual case, and carried out along the usual lines. It consists for the most part of the relief of symptoms, such as cough and pain, and the use of stimulants where there are signs of cardiac embarrassment. The tightness in the chest, which is so frequently present, may be relieved by inhalations of menthol and benzoin.

Sleeplessness is a dangerous complication, and must never be allowed to continue. It is particularly liable to occur in those cases in which tremor and other nervous symptoms are marked, and it is just in these very cases that absolute rest is of such paramount importance. Attention to the general management with regard to free ventilation, the avoidance of overheating, and the promotion of elimination, tends to reduce the frequency of this complication. If there be any symptom primarily responsible for the sleeplessness—such as pain or cough—the first essential will be its relief. Pain may be treated by the application of an ice-bag, or, if preferred, a hot poultice, and by a hypodermic of heroin: cough may be ameliorated by the administration of Tr. Chloroformi et Morphinæ Co. in doses of 10 minims repeated. Tepid sponging is often sufficient to induce sleep, but if this do not suffice, the patient should be given heroin gr.  $\frac{1}{12}$ th hypodermically, repeated at intervals of about an hour and a half until sleep is obtained. Paraldehyde in doses of ʒij is also often serviceable, and being an alcohol it has the advantage of being a cardiac stimulant as well as an hypnotic. It is usual to find that a satisfactory night's sleep is

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followed by considerable improvement in the patient's general condition.

Head symptoms may, for purposes of treatment, be regarded as a further result of sleeplessness. Their occurrence may usually be obviated if the practice be adopted of never allowing the patient to have a sleepless night. If developed, stimulants should be freely administered, and heroin repeated as above until sleep is obtained.

In the very toxic cases, the control of diarrhoea presents a problem of considerable difficulty, since it must be regarded as an effort of nature to reduce the degree of toxæmia. Speaking generally, it should not be interfered with unless it be so severe as to prevent the patient from obtaining sleep, or unless it appears to be increasing the danger of heart failure. In these cases, the judicious use of morphia or chlorodyne is indicated.

Those conditions which call for the free administration of stimulants have been already mentioned.

*During convalescence*, treatment is required for the debility which is a usual sequel, and which is so often accompanied in the severer cases by symptoms of weakness of the circulation. A period of comparative rest is needed, followed by one in which the patient takes gentle graduated exercise. The diet should be liberal and nourishing, and contain plenty of milk and eggs. In addition, the patient may be given a small quantity of port wine, cod-liver oil, arsenic, iron, or some bitter tonic, according to individual requirements. Stout or porter are useful adjuvants to the diet in the period of convalescence.

REFERENCES.—<sup>1</sup>“Studies of Influenza in Hospitals of the British Armies in France, 1918,” *Medical Research Committee Report*, No. 36.  
<sup>2</sup>“Treatment of Influenza,” Small and Blanchard, *Brit. Med. Jour.*, 1st March 1919. <sup>3</sup>Ellingwood, *Prescriber*, 1913, p. 275.



## AN INQUIRY REGARDING THE AGE AND SEX INCIDENCE OF PERNICIOUS ANÆMIA\*

By JOHN EASON, M.D.Ed., M.B., C.M., F.R.C.P.Ed.

WE have been taught and have since observed, according to our opportunities, that cases of pernicious anæmia are most numerous about the middle period of life. Such is the current opinion of practitioners and the present-day teaching of authorities as shown by the following quotations taken at random :—

"Age has no great influence. Most cases appear between twenty and forty years of age, but even young children of less than five years have been seen with the malady."—H. Amory Hare, *Practice of Medicine*.

"It occurs most frequently after the twentieth year and between that year and the age of fifty."—Musser, *Medical Diagnosis*.

"The onset of the disease is most common in late middle life. It has been observed at all ages."—Wilson, *Medical Diagnosis*.

"Mostly during middle life."—Anders, *Practice of Medicine*.

"It affects middle-aged persons, but instances in children have been described."—Osler, *Practice of Medicine*.

"The disease is most common between thirty and fifty, though no age seems exempt. It is very rare in children. Cases in old age are much more common."—Gulland and Goodall, *Diseases of the Blood*.

The most recently published figures have not led to any fundamental change of view. Thus—

Herbert French states that "the great majority of the patients of the cancer age, that is to say, between thirty and sixty."—*Allbutt and Rolleston's System of Medicine*.

R. C. Cabot, however, says that "Pernicious anæmia is a disease of elderly people, its incidence being not far different from that of cancer. The more carefully one studies the cases, whether at the bedside or in the literature, the rarer does it appear to find a typical case of pernicious anæmia before the thirty-fifth year. . . . More than half of all the cases collected occur between the fortieth and the sixtieth year. . . . The

\* Contributed to the Medico-Chirurgical Society of Edinburgh, 21st January 1920.

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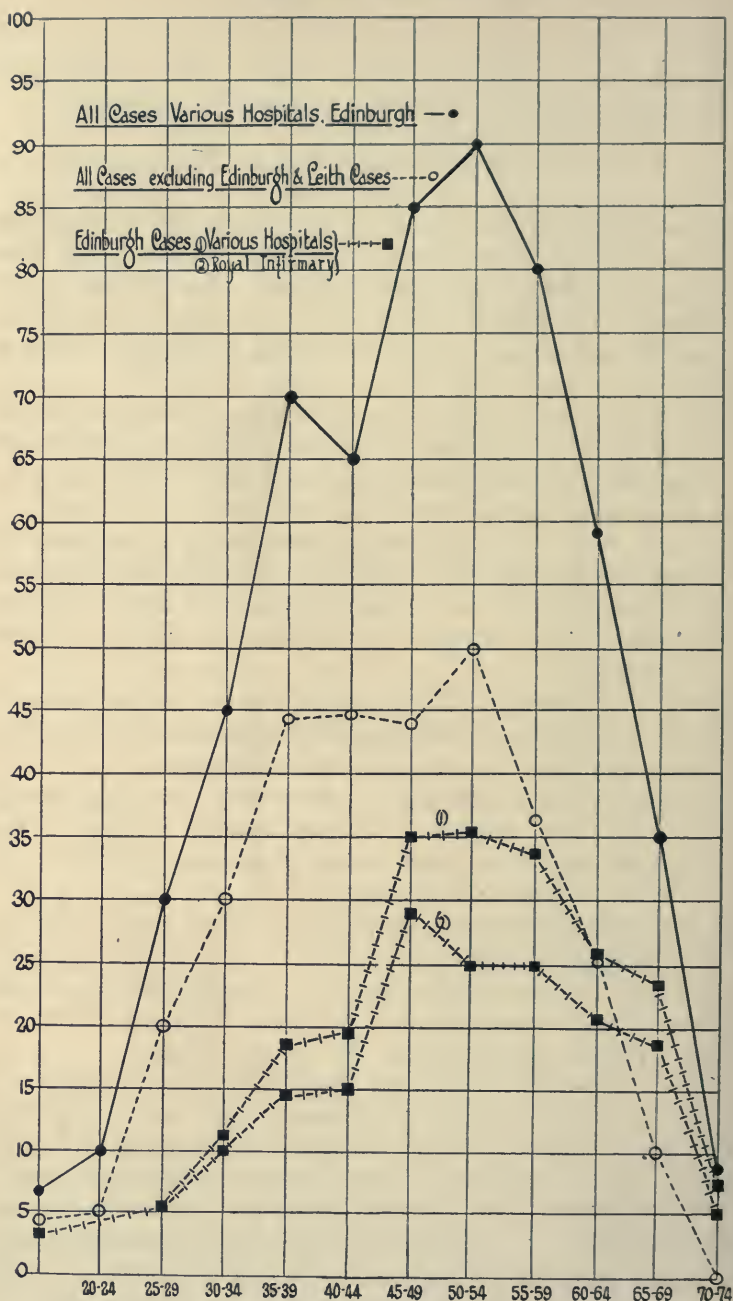


CHART I.  
(See Legends for Charts at end of paper.)

## Age and Sex in Pernicious Anæmia

disease is between six and seven times as common after the thirty-fifth year as before it."

When examined in this simple manner, my own figures based on the combined observations in Edinburgh hospitals during the past twenty-one years, bear out the views expressed in such quotations as I have made but especially those of Cabot and of French. As chart I. shows the quinquennium in which the largest numbers occur is fifty to fifty-four. As usually presented in the literature, the acceptance of this fact entails, I venture to maintain, firstly, that intrinsic or extrinsic deleterious forces, causing pernicious anæmia, are specially operating about the middle term of life; and secondly, that after this period of life has been traversed, these forces become less active. It is accordingly a matter of no little importance that the evidence hitherto founded on should be scrutinised. I hope to show that the manner of presenting the statistical data has been wrong and that the inferences above stated are from premises that should no longer be allowed.

I wish to submit that there are three chief defects in all published statistics on the age incidence of pernicious anæmia—two of these so flagrant that they are responsible for an entirely erroneous impression regarding (*a*) the age incidence and (*b*) probably regarding the essential nature of pernicious anæmia.

Reasons for questioning the validity of statistics of pernicious anæmia as hitherto published.

I. In examining the curves representing the numbers of cases admitted during successive quinquennial age periods, I have found that the curve of the Edinburgh cases shows a well-defined difference from the curve representing cases admitted to Edinburgh hospitals from the country or other towns. Further, the characteristics respectively of the Edinburgh and the "extra-mural" curves are shown consistently in the "total" as well as in the "male" and "female" cases.

These are shown in charts I. II. and III. Taking chart I. for example, a marked preponderance of extra-mural cases is shown up to the age of fifty-four. Thereafter there is a much more rapid diminution of the "extra-mural" than of Edinburgh cases with the result that in the last quinquennium of the statistics, the latter greatly preponderate. Chart II. representing male cases and chart III. female cases, both show this characteristic statistical feature.



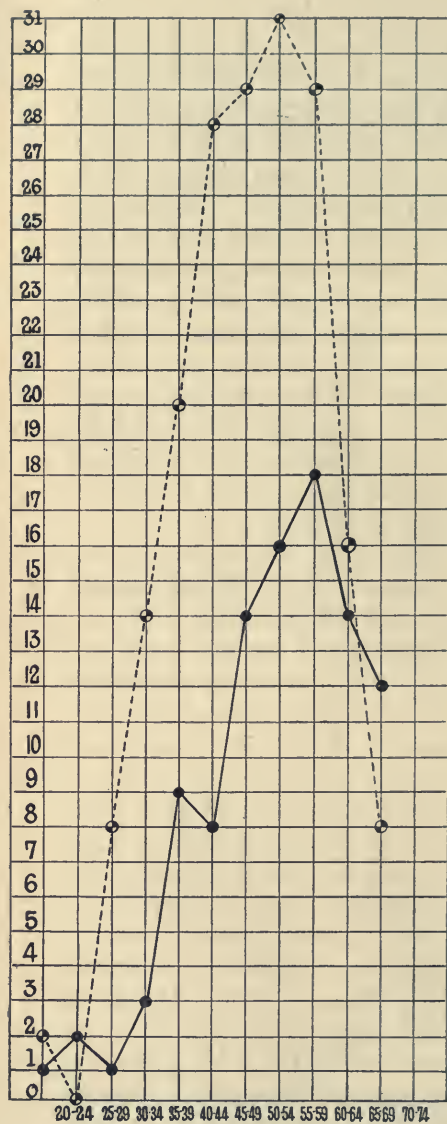


CHART II.—MALES. Quinquennial Numbers.

Edinburgh Cases —●—  
Country Cases - - -○-

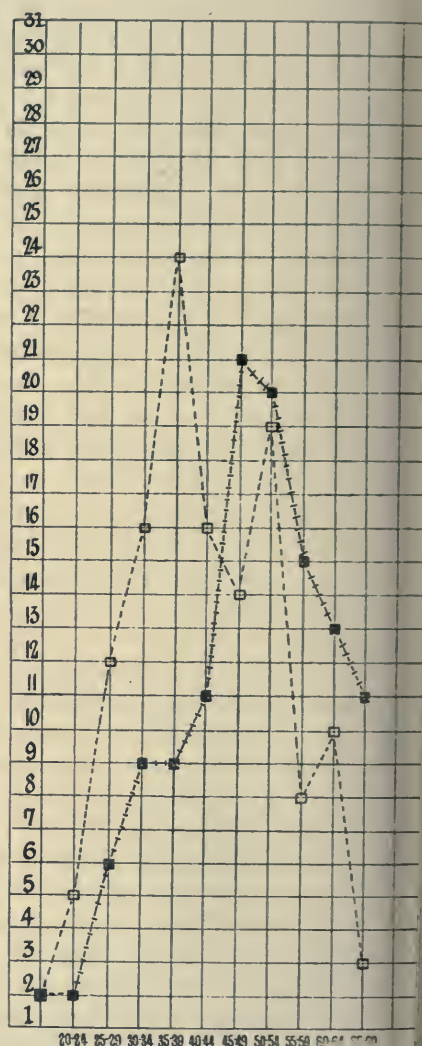


CHART III.—FEMALES. Quinquennial Numbers.

Edinburgh Cases - - -■- -  
Country Cases - - -□-

# Age and Sex in Pernicious Anæmia

It is therefore important to determine which of these curves is the true curve—the extra-mural one or the city one.

Why is it that half the extra-mural cases are admitted by the forty-fifth year while this does not occur for the Edinburgh cases until the fifty-second year?

The circumstances that lead to the results shown in these divergent curves concern the patient, the patient's friends, and the family doctor.

(1) The elderly patients are less willing to leave home and travel to a distant hospital. They have become willing and able to realise and more disposed to resign themselves to the unfavourable prospect. The reasoning will doubtless have countless variations but the ruling reason in most is the preference to die at or near home.

(2) The relatives realise that the life is a less valuable one and, rightly or wrongly, are readier to accept the illness as a terminal one. In the circumstances there is no insistent call made by them for specialised treatment.

(3) The combined effect of the interacting factors is to make the position of the medical attendant an infinitely more tolerable one so that, on his part, the patient is not passed on to a hospital, unless there are genuine medical reasons.

These and possibly other considerations operate to render the "extra-mural" curve abnormal and misleading.

This abnormality applies not merely to cases of pernicious anæmia but to all forms of medical diseases as will be seen on referring to chart IV.

I conclude from this that the only reliable basis for calculation is from the cases of pernicious anæmia among the local sick.

This is my first reason for questioning the reliability of published statistics.

II. The age incidence of pernicious anæmia has not hitherto been considered in relation to the age distribution of the population.

Remembering the orthodox view that pernicious anæmia is most prone to attack individuals about the middle period of life, it is obviously of great importance to compare the number of cases at different age periods with the respective age-period populations.

In making the comparison, the extra-mural cases must be discarded, not only for the reason discussed under I, but also

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because one must confine the enquiry to an area whose population and population age-distribution is known.

In co-relating the incidence of hospital cases of pernicious anæmia to the population of the area, an absolute rate is obviously not obtained. Although absolute measures of the

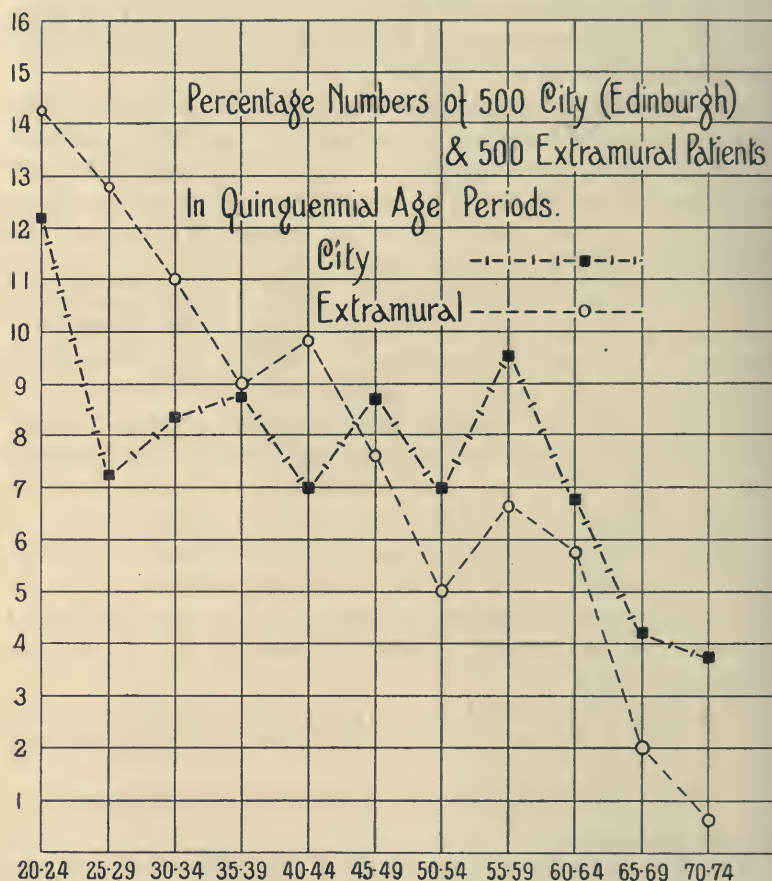


CHART IV.

frequency cannot be obtained, it is possible to draw legitimate deductions regarding the age incidence of the disease amongst the hospital classes, from the relative figures of the different age periods. Such deductions are valid if there is no reason to suppose that the ratios of the hospital classes of the population to the other classes undergoes any important changes in the different age periods.



# Age and Sex in Pernicious Anæmia

Although the deductions made from hospital statistics can be legitimately applied only to the incidence in hospital classes there is no reason known to the writer for supposing that the age incidence in other classes has special features.

III. The basis of ideal statistics must be pathological as well as clinical evidence.

The difficulty here is that probably no single medical school can yet furnish large enough figures of consecutive cases on this

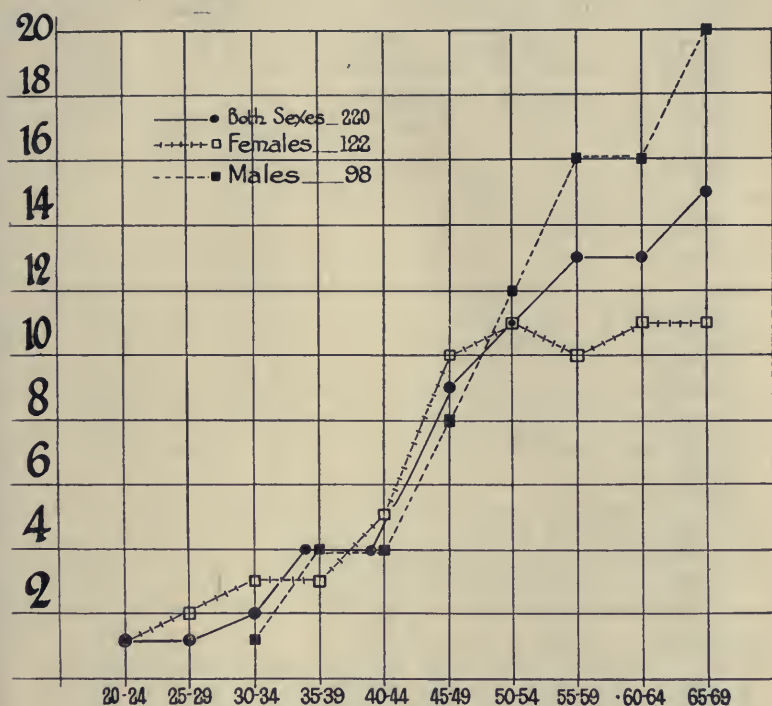


CHART V.—PERNICIOUS ANÆMIA.

220 Edinburgh Cases in Edinburgh Hospitals. Twenty-one years' Incidence Rate per 100,000 of Edinburgh Population.

basis. Compulsory post-mortem examination and the collected statistics of various medical schools would require to be available to provide adequate data on which more or less definite conclusions could be based.

In an analysis of cases admitted to Edinburgh hospitals during past twenty-one years,

(a) I have discarded all but Edinburgh cases in the calculations that have been made.

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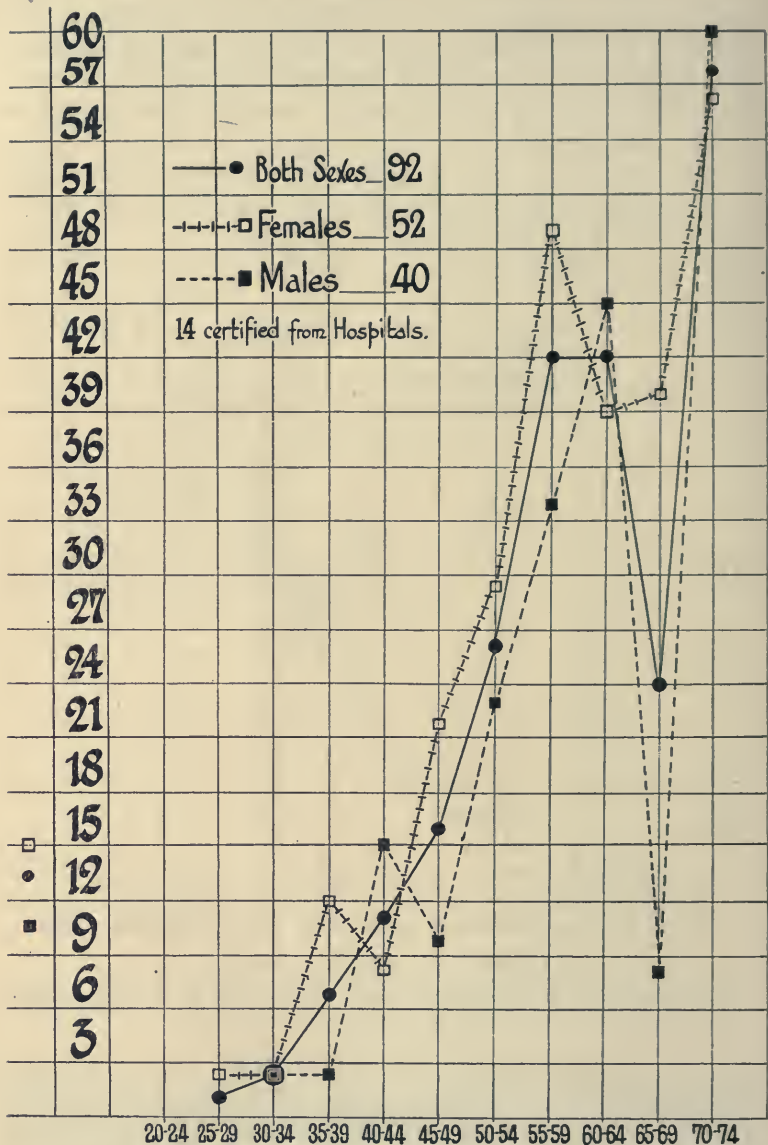


CHART VI.—PERNICIOUS ANÆMIA.

Death Rate per 100,000 of Population. Calculated from Deaths registered  
October to December 1919 in Scotland.

# Age and Sex in Pernicious Anæmia

(b) The age incidence and sex incidence of Edinburgh cases are shown in relation to the mean age distribution of the population, the rates being calculated at the department of the Registrar-General for Scotland for which Dr James C. Dunlop is responsible.

(c) Chart V. shows the male, female, and total rates of incidence.

(d) The Registrar-General's returns for Scotland are given for a short period showing the ages at death certified as due to pernicious anæmia. The results are shown in Chart VI. as rates per 100,000 of the population at successive quinquennial age periods.

(e) The figures and rates shown in Charts V. and VI. have little weight as absolute case rates in Edinburgh or death rates in Scotland, but a few suggestive points may legitimately be deduced. These are—

(1) The Edinburgh Hospital cases show a maximum frequency at ages fifty-five to sixty-nine, while the Scottish death figures show a similar maximum at ages fifty-five to sixty-four and a second maximum at ages seventy to seventy-four. With the small numbers this correspondence is very close.

(2) The second maximum in the death figures may or may not be attributable to faulty certification and diagnosis, the term being used as applicable in cases of advanced anæmia in elderly people, perhaps without blood examination and perhaps in cases where the cause of anæmia—cancer or the like—was not recognised. There is an alternative possibility, viz., that the depression between the two maxima of the death figures is a false one owing to the brief period (three months) reviewed and the small numbers (ninety-two).

(3) In both the Edinburgh male "case" figures and the Scottish "death" figures there are well-marked maximal frequencies at ages over sixty; in the "case" figures at ages sixty-five to sixty-nine and in the death figures at sixty to sixty-four and seventy to seventy-four, while the maximal frequencies in the female sex is not so well marked and somewhat younger. In the Scottish death figures there are female maxima at ages fifty-five to fifty-nine and seventy to seventy-four; in the Edinburgh hospitals case figures the female maximum is not well marked and there is a plateau between fifty and seventy.



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## SUMMARY AND CONCLUSIONS.

(1) Authorities have almost without exception stated that individuals about the middle period of life were specially prone to develop pernicious anæmia.

(2) Hypothesis and investigations based on hypothesis may proceed on futile lines if this view of the incidence is wrongly maintained.

(3) The evidence from a large general hospital of a medical school probably in all cases misleads unless cases of local sick from pernicious anæmia alone are the basis of conclusions.

(4) On this basis Edinburgh hospitals show the largest numbers between the ages of forty-five to fifty-nine.

(5) The rate in these hospitals per 100,000 of the population is highest between fifty-five and sixty-nine.

(6) The pernicious anæmia death rate figures for Scotland correspond very closely with the Edinburgh Hospital case figures.

(7) Until the age of fifty the rate of incidence inclines to be higher in the female than in the male. Thereafter the rate is definitely higher in males than in females.

(8) It appears that senility is a more important etiological factor than has hitherto been generally recognised.

(9) There appears to be an increasing liability to pernicious anæmia with advancing years.

I have pleasure in acknowledging the valuable help and advice kindly given by Dr James Crawford Dunlop, Superintendent of Statistics of H.M. General Register House and Professor Lovell Gulland.

## DESCRIPTION OF CHARTS.

Chart I. Showing total cases of pernicious anæmia admitted to Edinburgh hospitals during the twenty-one years from 1898 to 1919. The base line shows quinquennial age periods and the vertical shows the number of cases admitted.

Chart II. Male cases of pernicious anæmia admitted to Edinburgh hospitals during the twenty-one years from 1898 to 1919.

Chart III. Female cases of pernicious anæmia admitted to Edinburgh hospitals during the twenty-one years from 1898 to 1919.

Chart IV. Shows the curves representing admission of all varieties of medical cases from the city of Edinburgh and from extramural sources,

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and the more rapid reduction of extramural cases from the forty-fifth year onward.

Chart V. These are Edinburgh hospitals incidence rates—not absolute measures—showing the age incidence per 100,000 of population for both sexes and for males and females. The base line shows quinquennial age periods and the figures in vertical column show rates.

Chart VI. The figures in vertical column indicate actual rates for a brief period, based on Registrar-General's return for Scotland. Fourteen of 92 cases were certified from hospitals. The majority of pernicious anæmia cases in Edinburgh hospitals and probably in other hospitals in Scotland die at home. It is probable that the majority of the 92 cases had been either hospital cases or consultation cases.

## NEW BOOKS

*Tropical Ophthalmology.* By R. H. ELLIOT, F.R.C.S., Lt.-Col. I.M.S. (retired). Pp. xxiii + 525, with 124 illustrations. London: Henry Frowde and Hodder & Stoughton. 1920. Price 3rs. 6d. net.

The former Superintendent of the Government Ophthalmic Hospital, Madras, now the Lecturer on Ophthalmology at the London School of Tropical Medicine, has brought forth from his rich treasure-house of oriental experience a work which will not only appeal to every ophthalmic surgeon but to every medical practitioner in tropical lands.

The writer's claim that no similar work has hitherto been produced in the literature of ophthalmology is well founded. In his introductory section Colonel Elliot gives an interesting account of the peculiar conditions by which eye diseases are environed in the Tropics. In succeeding sections he deals with the effects of exposure to glare, wind, dust, and injuries inflicted on the eye by animals, through mechanical or chemical agents, or by bites or stings. Some sixty pages are devoted to the parasitic diseases of the eye induced by trematodes, cestodes, various types of filaria, arthropoda, etc.

The Indian operation of couching for cataract and its attendant dangers are fully described, and this is followed by a minutely detailed account of the selection and preparation of patients, and the methods of operating for cataract as practised in the Madras clinique by the author and his colleague and successor, Colonel H. Kirkpatrick.

Most of the illustrations are helpful, but it is open to question whether the photographs reproduced in Figs. 61 to 65 in this chapter have much educative value. For medical men who have never witnessed a cataract operation simple diagrams would be more instructive, supposing any were rash enough or compelled to hazard the operation with only such guidance as may be gathered from an illustrated description.

Diseases of the conjunctiva, cornea, eyelids, and tear passages are carefully discussed, and useful suggestions are given on various points.

Colonel Elliot has written elsewhere so fully on the subject of glaucoma that he has evidently thought it unnecessary to make more than a brief reference to it in the volume under review. An equally brief account of the ophthalmoscopic appearances of the fundus as met with in the Tropics is contributed by Colonel Kirkpatrick. But any disappointment which may be felt by the reader of these chapters will be forgiven in view of the admirable summary of information supplied in the concluding section of the monograph, which deals with the



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ocular manifestations of a variety of general tropical diseases extending from beri-beri to yaws and yellow fever. In this department the author has been happily aided by various experts.

In his preface Colonel Elliot very rightly points out that no man can write a complete work on tropical ophthalmology alone, and we cannot conclude this brief review of a meritorious work without expressing the hope that it will find many readers able and willing to respond to the author's appeal to assist him with specimens, items of information, or criticisms for the development of his subject in future editions.

*Clinical Ophthalmology for the General Practitioner.* By A. MAITLAND RAMSAY, with foreword by Sir James Mackenzie. Pp. xx + 500, with 20 plates and diagrams. London: Henry Frowde and Hodder & Stoughton. 1920. Price 42s. net.

This book, as the author points out in the preface, is not intended to be a systematic treatise on Ophthalmology. It is purely clinical, deals with the symptomatology of eye diseases, and is an attempt to present the subject to the general practitioner as he meets it in the course of his daily work. To write such a book on a highly specialised branch of medicine is no easy task, but Dr Ramsay has succeeded well in his undertaking. The information that he gives is drawn largely from his own very wide experience, and one feels that his statements are based upon his own observations and not merely upon the writings of other workers.

Each chapter is complete in itself, and although this arrangement necessitates a certain amount of repetition, it enables the seeker after information to obtain what he requires more readily than would otherwise be the case. All the conditions that are likely to come in the way of the general practitioner are dealt with in detail. The intimate connection between the eye and the rest of the body is everywhere insisted upon, and the directions as to treatment are as full as they well could be.

The author has excluded matter that is of importance to the specialist alone, but clear explanations of pathology, operative treatment, etc., are given when he considers it necessary to the practitioner for the understanding of his case. At the same time he is careful to indicate how far the practitioner is capable of treating eye cases himself, and when expert aid must be sought.

In addition to a systematic description of all the commoner affections, there are a number of chapters each dealing with a symptom alone that will be of special value. Those on the clinical significance of a hard eye, and of failing sight may be instanced. Such important subjects as injuries and ophthalmia neonatorum are described fully,

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and in connection with the former there is a clearly written chapter on the Workmen's Compensation Act. There is also a very complete collection of prescriptions and therapeutic notes, and a useful glossary of special terms. The photographs, coloured plates, and diagrams are excellent.

Dr Ramsay's book cannot fail to be of great service to the general practitioner, particularly if he is not in a position to obtain the help of a specialist at short notice.

*Venereal Diseases: Their Clinical Aspect and Treatment.* By J. E. R. M'DONAGH, F.R.C.S. Pp. xii+419, with 127 illustrations. London: Wm. Heinemann. Price £3, 3s.

Mr M'Donagh's previous work on the biology of venereal diseases is so well known that many will be attracted by his present work on the clinical aspect of the subject. The earlier chapters deal with syphilis, and all essential details of the clinical diagnosis of the disease as it affects the various organs are minutely presented. Actual cases which have passed through the author's hands are discussed, and the text is profusely illustrated with many excellent plates which reflect credit on both artist and publisher.

He divides the disease into four stages (1) localised, (2) generalised, (3) latent, and (4) recurrent syphilis, in preference to the older and less scientific primary, secondary, and tertiary stages. Special importance is laid on the observation of the early signs of involvement of the nervous system before gross lesions have set in, a subject too often omitted or glossed over in many text-books on syphilis.

He is of opinion that neuro-syphilis is on the increase due chiefly to four factors: (a) sterilising the systemic and not the nervous part of the body, (b) too free use of oxidising agents (metals) such as arsenic and mercury, (c) insufficient use of reducing agents (non-metals) such as intramine, (d) failure to supplement the maximum course by intermittent courses for one or two years.

In dealing with treatment he starts with the belief that "The *Spirochaeta pallida* is only the adult male of a coccidial protozoon, that the complement fixation test is merely a physical reaction dependent upon the increased number and size of the protein colloidal particles in the serum, and that salvarsan only destroys the parasite indirectly by increasing the oxidising action of the host's protective substance," and proceeds to build up a system of treatment by combining metals and non-metals, the latter to aid the action of the former and also to overcome the toxic effects produced by their overuse. This belief, however ingenious, is only theory and many will disagree with him regarding it. In considering these chapters on

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treatment one must remember that the basis built on is speculative, and is not supported by established and accepted facts; and this applies equally to the author's assumptions on the method of action of the therapeutic agents he advocates. He is too prone to theorise, and does not display enough caution in drawing general conclusions, which the reader would be well advised to accept with caution.

Gonorrhœa and its complications is dealt with in the later chapters. His observations on clinical diagnosis and local treatment of this condition give abundant evidence of wide clinical experience. Local treatment by strong antiseptics is deprecated. Little, if any importance is attached by the author to the use of the urethroscope in either diagnosis or treatment. "Anything found by its use can be equally well ascertained by a catheter *à boule* without exposing the patient to the risk of injury." Many workers on the subject will disagree with him in this sweeping statement.

In discussing the treatment of gonococcal infections he is of opinion that they can only be eradicated by administering treatment through the bloodstream in addition to local treatment, and of the two methods available he prefers chemo-therapy to vaccine therapy. Plausible theory is again the groundwork on which he builds up the therapeutic action of the various chemical substances he prescribes. His arguments on their action in assisting to build up immunity are always speculative and often unconvincing, and we doubt if his enthusiasm for chemo-therapy will be shared by many.

The chapters dealing with soft sores, subsidiary venereal diseases, sexual neurasthenia, and the social aspect of the diseases are well written.

Throughout the whole volume the author repeatedly emphasises the importance of the consistent training of the clinician, and warns against certain present-day tendencies to place too much trust in mechanical laboratory methods; yet it is surprising to find how often pathological findings obtrude themselves in support of his theories. Apart from this tendency to theorise and dogmatise on the biochemistry of infection and immunity, and on the therapeutic action of colloids, the work is an interesting and original exposition of the subject and contains much useful and valuable information.



## NEW EDITIONS

*Occupational Affections of the Skin.* Second Edition. By R. PROSSER WHITE, M.D. (Ed.), M.R.C.S. (Eng.). Pp. xiv + 360, 24 Plates. London: H. K. Lewis & Co., Ltd. Price 25s. net.

Dr Prosser White's second edition will be welcomed by all dermatologists who had appreciated the value of his work. Favourably placed in the centre of an area the seat of almost innumerable varieties of industry, he has used his opportunities to the full and has produced what will be a work of reference for many years.

The full description of the processes involved in the different industries shows how thoroughly Dr Prosser White has done his work. Where he has not had personal experience he has searched the literature with unusual diligence and has supplied a bibliography which will greatly lighten the labours of those who come after him.

An exceptionally full index of no fewer than seventy pages adds to the usefulness of the book.

We must hope that before the third edition appears the paper trade will be in full order again and the illustrations have a better chance; and dare we suggest that a little more attention might be given to the genders of the dermatological terms.

Meantime we recommend everyone engaged in industrial practice, and even those who are not, to place a copy of the book in their libraries.

*Diseases of the Chest, and the Principles of Physical Diagnosis.* By GEORGE WILLIAM NORRIS, A.B., M.D., and H. R. M. LANDIS, A.B., M.D., Assistant Professors of Medicine in the University of Pennsylvania. Second Edition. Pp. 844, with 433 illustrations. Philadelphia and London: W. B. Saunders Co., Ltd. 1920. Price 35s. net.

This volume deals with the methods of examination of the heart and lungs and with the diseases of these organs. The chapter dealing with the electrocardiograph has been written by Dr E. B. Krumbhaar. It is seldom that a volume is submitted for review that contains so much of an original nature. On opening the book one is at once struck by the character of the illustrations, a large proportion of which are photographs of frozen sections from the cadaver, illustrating diseased organs *in situ*. This method, which could only be practicable where anatomical material is very plentiful, lends a singular interest to the text, and certainly supports the many novel explanations of the phenomena of disease which the book contains. Procedures employed

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in physical examination are considered particularly in relation to acoustics, and the conclusions arrived at are in many cases somewhat different from those usually accepted on this side of the Atlantic. Many excellent diagrams are interspersed throughout this portion of the text. The sections which deal with the individual diseases of the heart and lungs are clearly and well written, and are in addition thoroughly up to date. The symptoms and physical signs are considered in relation to pathological findings. It is obvious that the amount of labour expended in the production of the volume has been great. The book is in many respects unique, and can be commended for its original features, too numerous to mention in detail. More careful reading of the proofs would lead to the elimination of a large number of misprints.

## NOTES ON BOOKS

*The Shibboleths of Tuberculosis*, by Marcus Paterson (John Murray, 1920, price 10s. 6d.), consists of sixty short, pithy chapters into which the author has gathered together much useful information. The Shibboleths are well-known "catch phrases" relative to tuberculosis, and are used as titles to the chapters. The time-honoured beliefs are sharply criticised and destructively dealt with. The book appears at a useful time when there is much discussion on many aspects of this world-wide problem. Dr Paterson gives his views in no uncertain fashion, and the book is written throughout in vigorous and breezy style. The author's well-known views on auto-inoculation and graduated labour are clearly set out with many clinical examples. Among many good chapters those dealing with various aspects of Sanatoria are to be commended, more particularly the chapter entitled "That the Superintendent of a Sanatorium has a 'Cushy' Job." Any aspirant to such a responsible post would do well to read this section of the book with much care before making his final decision. Dr Paterson draws a sharp distinction between Sanatoria and "Homes for Tuberculosis." Two chapters dealing frankly and firmly with the vexed question of "sputum positive" and "sputum negative" cases are of special value in these controversial times. The views expressed on Farm Colonies will not, we think, meet with universal agreement. The last chapter contains an excellent summary of the author's views, in which, however, he states that there is no compulsory course in Tuberculosis for students. We would remind him that a chair of Tuberculosis was founded in Edinburgh a few years ago, and is held by Sir Robert Philip. The University authorities took an early opportunity of making this course a compulsory one for the students.

## Notes on Books

The ten addresses in *Public Health and Insurance* were delivered to University and other audiences in America, by Sir Arthur Newsholme (Johns Hopkins Press, price \$2½), and give an account of the development of Public Health activities in England from the beginnings in the earlier half of the last century to the latest, for which the author was himself largely responsible. All aspects of Public Health work are discussed from the social view-point, and there is a refreshingly frank criticism of the National Insurance Act. The need of a public medical service in the widest sense and paid by salary not by capitation fee, is convincingly urged. The volume is written by an acknowledged leader in his subject, and should be read by every doctor and by every layman interested in social service.

*Professor E. Sharpey Schafer's Essentials of Histology* (Longmans, Green & Co., price 14s. net) needs no introduction. The regular appearance of new editions—this is the eleventh—is sufficient evidence of its well-deserved popularity. The book gives a good description of the various tissues of the body, and the text is generously illustrated. Many of the reproductions are in colours and this serves to show up detail better than the usual black-and-white process. Teachers of the more applied branches of medicine will be glad to see that a fair proportion of the illustrations are made from human tissues. We believe that this volume is much the best of its kind at the present time.

Dr W. Cramer's *Directions for a Practical Course in Chemical Physiology*, Fourth Edition (Longmans, 1920), contains a number of directions for carrying out exercises in chemical physiology along with some didactic teaching and a number of unanswered questions which are intended to arouse the interest of the student. If we know the student they are more likely to cause him annoyance. The preface is mainly a polemic in support of the author's views on blood coagulation. In our opinion there are books on the subject much more helpful to students of medicine, but four editions in eight years indicate a considerable amount of appreciation.

The second edition of Dr A. S. Woodward's *Manual of Medicine* (Oxford Medical Publications, price 16s. net) has been brought well up to date by the inclusion of advances in knowledge produced by the war, new methods of treatment like fasting in diabetes, etc. Very clear and brief descriptions are given of subjects on which the student must obtain a general idea, *e.g.* immunity. Though the practitioner will find it rather too abbreviated to help him much, it forms an excellent manual for students.



# BOOKS RECEIVED

BAINBRIDGE, F. A., and J. ACKWORTH MENZIES. Essentials of Physiology. Fourth Edition . . . . .	(Longmans, Green & Co.)	14s.
BALLANCE, Sir CHARLES A. Surgery of the Heart . . . . .	(Macmillan & Co., Ltd.)	10s. 6d.
BERKELEY, COMYNS, and Others. Midwifery. Second Edition. . . . .	(Edward Arnold)	30s.
BERKELEY, COMYNS, and VICTOR BONNEY. The Difficulties and Emergencies of Obstetric Practice. Third Edition . . . . .	(J. & A. Churchill)	42s.
BLACKHAM, R. J. Pocket Guides to First Aid. Nos. 1-6 . . . . .	(John Bale, Sons & Danielsson, Ltd.)	6d. each
BRADBY, M. K. The Logic of the Unconscious Mind . . . . .	(Henry Frowde and Hodder & Stoughton)	16s.
BRICKDALE, J. M. FORTESCUE. A Text-Book of Pharmacology and Medical Treatment for Nurses . . . . .	(Henry Frowde and Hodder & Stoughton)	25s.
BUCKMASTER, G. A., and H. R. B. HICKMAN. A Course of Practical Physiology . . . . .	(John Wright & Sons, Ltd.)	5s.
CENTENARY VOLUME of Charles Griffin & Co., Ltd. . . . .	(Charles Griffin & Co., Ltd.)	—
CREIGHTON, CHARLES. Some Conclusions on Cancer . . . . .	(Williams and Norgate)	42s.
DEWBERRY, ELLIOT B. Prevention and Destruction of Rats . . . . .	(John Bale, Sons & Danielsson, Ltd.)	2s.
DRUMMOND, MARGARET. Five Years Old or Thereabouts . . . . .	(Edward Arnold)	5s.
FRAZER, J. ERNEST. The Anatomy of the Human Skeleton. Second Edition . . . . .	(J. & A. Churchill)	36s.
GROVES, ERNEST W. HEY. A Synopsis of Surgery. Fifth Edition . . . . .	(John Wright & Sons, Ltd.)	17s. 6d.
HENDERSON, I. F., and W. D. HENDERSON. A Dictionary of Scientific Terms . . . . .	(Oliver & Boyd)	18s.
HENRY, ROBERT, et André D'Emonchy. Manuel d'Urétroscopie . . . . .	(Masson et Cie.)	Frs. 25
HOWARD, RUSSELL. Surgical Nursing. Fourth Edition . . . . .	(Edward Arnold)	7s. 6d.
HUNTER, WILLIAM. The Serbian Epidemics of Typhus and Relapsing Fever in 1915 . . . . .	(John Bale, Sons & Danielsson, Ltd.)	—
HUTCHISON, ROBERT. Lectures on Diseases of Children. Fourth Edition . . . . .	(Edward Arnold)	21s.
JAMESON, W. WILSON, and F. T. MARCHANT. Hygiene . . . . .	(J. & A. Churchill)	18s.
JONES, H. LEWIS. Revised and edited by Lullum Wood Bathurst. Medical Electricity. Eighth Edition . . . . .	(H. K. Lewis & Co., Ltd.)	22s. 6d.
KELLY, HOWARD A., and WALTER L. BURRAGE. American Medical Biographies . . . . .	(The Norman Remington Company)	
LABBÉ, MARCEL. Le Diabète Sucré . . . . .	(Masson et Cie.)	Frs. 20
LAPAGE, C. PAGET, and MARY DENDY. Feeble-mindedness in Children of School Age. Second Edition . . . . .	(Longmans, Green & Co.)	10s. 6d.
NICOLLE, M. Les Antigènes et les Anticorps . . . . .	(Masson et Cie.)	Frs. 4.50

## Books Received

OSLER, Sir WILLIAM and THOMAS M'CRAE. The Principles and Practice of Medicine. Ninth Edition. . . . .	(D. Appleton & Co.)	30s.
PARKER, G. The Early History of Surgery in Great Britain	(A. & C. Black, Ltd.)	7s. 6d.
PIERSOL, GEORGE A. Normal Histology. Twelfth Edition	(J. B. Lippincott Company)	21s.
PORTER, CHARLES. School Hygiene and the Laws of Health. Fifth Edition . . . . .	(Longmans, Green & Co.)	6s. 6d.
RIVERS, W. H. R. Instinct and the Unconscious	(Cambridge University Press)	16s.
ROBERTS, FFRANGCON. Physiology. . . . .	(J. & A. Churchill)	15s.
ROBERTS, MORLEY. Warfare in the Human Body	(Eveleigh Nash Company, Ltd.)	18s.
SHARPE, WILLIAM. Diagnosis and Treatment of Brain Injuries	(J. B. Lippincott Company)	35s.
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STERNBERG, MARTHA L. George M. Sternberg: A Biography	(American Medical Association, Chicago)	—
TRANSACTIONS OF THE AMERICAN GYNECOLOGICAL SOCIETY. Vol. xlv. 1919 . . . . .	(Wm. J. Dornan)	—
TRANSACTIONS OF THE AMERICAN SURGICAL ASSOCIATION. Vol. xxxvii. 1919 . . . . .	(Wm. J. Dornan)	—

## ANALYTICAL REPORT.

### DIAL "CIBA" (CLAYTON ANILINE COMPANY LTD.).

WE have received from the makers specimens of Dial, or, to give it the full name, Diallyl barbituric acid, which, though one of the newer hypnotics, has now been in use for long enough to admit of a definite opinion being expressed. Our experience of the drug is that it is a trustworthy hypnotic of the veronal series, but that it is more rapid in its action, and is comparatively free from side effects. It appears to be more suitable for prolonged use than many of its congeners. The dose is rather small— $1\frac{1}{2}$  to 3, or in urgent cases  $4\frac{1}{2}$  grs. The same firm also send out, in tablet form, Didial "Ciba Brand"—the diallyl barbiturate of ethyl morphine, which is more active and is said to be useful in cases of mental excitement.

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## MEDICAL EDUCATION IN SCOTLAND

ACCORDING to the Regulations of the General Medical Council, a candidate for a medical qualification must (1) pass a preliminary examination; (2) register as a medical student; (3) study for five years at a recognised school; (4) obtain a degree or diploma; and (5) place his name on the *Medical Register*. No person whose name is not on the *Register* may legally sign certificates, give medical evidence in Courts, or sue for fees.

The following degrees and diplomas are available in Scotland:—Bachelor of Medicine and Bachelor of Surgery (M.B., Ch.B.), conferred by the Universities. Doctor of Medicine (M.D.) and Master of Surgery (Ch.M.) are higher qualifications conferred only on those who already hold the M.B., Ch.B.

The *Triple Qualification* (L.R.C.P.E., L.R.C.S.E., L.R.F.P.S.G.) is conferred by the two Royal Colleges and the Royal Faculty jointly. The Fellowships, Memberships, and Licences of these Corporations may also be registered as higher or additional qualifications.

Special degrees and diplomas in public health are also granted by the Universities and Corporations.

### THE UNIVERSITIES.

**PRELIMINARY EXAMINATION.**—Before commencing his course of medical study each student shall pass a preliminary examination in (1) English, (2) Latin, (3) Mathematics, and (4) an additional language—Greek, French, German, Italian, or such other as the Senatus shall approve. In the case of a candidate whose native language is other than English, an examination in another classical language—*e.g.* Sanskrit or Arabic—may be substituted for Latin, and an examination in the candidate's native language may be substituted for the additional language. A student must pass all the subjects at not more than two examinations. A degree in Arts or Science of any recognised University exempts from the preliminary, and certain other examinations may be accepted as substitutes.

**MATRICULATION.**—Having passed the preliminary examination, the student must, within fifteen days after the commencement of the session, matriculate at the University and pay the fee, which is £1, 1s. for the whole year, 10s. 6d. for the summer session alone.

**REGISTRATION.**—Within fifteen days of commencing his studies he must register as a medical student. He must be not less than sixteen years of age, must have passed the preliminary examination, and must show that he has begun his medical studies.

**THE CARNEGIE TRUST.**—This Trust is prepared to pay a portion of the class fees of students (who have passed the specified preliminary examination) for all classes, whether attended within the Universities or in any of the Extramural Schools. It is also prepared to pay the fees for the various special classes given by many of the Lecturers upon advanced and non-compulsory subjects. Applicants (1) must be over sixteen years of age; (2) must be of Scottish birth or extraction, or must have given two years' attendance after the age of fourteen at a school or institution under inspection of the Scottish Education Department; and (3) must be qualified by preliminary examination under the ordinances of the Scottish Universities Commission and the regulations of the Scottish Universities Entrance Board, to attend the classes for which payment of fees has been claimed.



# Medical Education in Scotland

Schedules of application for admission to the benefit of the Trust are obtainable by written application to the Secretary of the Trust, 22 Hanover Street, Edinburgh.

## UNIVERSITY OF EDINBURGH.

The University of Edinburgh offers many attractions to the student of medicine. The various departments are well equipped for purposes of teaching and research, and there are ample facilities for clinical instruction. The Royal Infirmary, the Royal Hospital for Sick Children, and the Royal Maternity Hospital are in the immediate vicinity of the University, while the Royal Asylum for the Insane, the Fever Hospital, and the various dispensaries can be reached within half an hour.

Students may attend one half of their classes in the Extramural School, and are thus offered a choice of teachers on the different subjects of the curriculum.

An important agreement between the University and the Royal Infirmary has been reached by which the teaching resources of the latter are more fully available for University students than formerly. The agreement provides that all the senior members of the Infirmary staff (those in charge of wards) become senior University lecturers and examiners, while the assistant physicians and surgeons become University lecturers, and take a share in the clinical teaching. The clinical tutors also take a recognised place in University teaching, and the medical demonstrations are held at a morning hour instead of in the evening.

The social side of student life is provided for in many ways. The University Union, with a membership of 1500, has a debating-hall, a library, reading rooms, billiard rooms, and a catering department.

The Royal Medical Society, founded in 1737, offers the student the advantages of an extensive medical library and reading rooms, while in its spacious hall many whose names have since become famous have made their first essay in medical debate. The Australasian Club and the South African Union are the headquarters of students from these parts of the Empire.

The Town and Gown Association provides a number of student residences, which are managed by a committee of the residents.

Women students are now admitted to the systematic lectures and practical classes within the University and to the clinical classes in the Royal Infirmary.

Under a recent regulation attendance on classes of instruction in the various special departments is compulsory. This change has necessitated a rearrangement of the curriculum, and an important regulation was introduced which has the effect of limiting a student's attendance on later subjects of the curriculum until he has passed the professional examinations on the earlier subjects.

Particulars regarding the curriculum will be found in the University calendar or "medical syllabus," published by James Thin, 55 South Bridge.

It is recommended that students begin study in the Summer Session.

The curriculum is as follows :—

### FOR STUDENTS BEGINNING IN SUMMER.

#### *First Summer Term—*

	Hour of Meeting of Class.
Botany . . . . .	8-9
Practical Botany (on days to be arranged) . . . . .	9-11
Physics . . . . .	12-1
Practical Anatomy (thrice weekly) . . . . .	Afternoon

(*Examination in Botany and Physics.*)

# Edinburgh

## First Year.

### Winter (1st Term)—

	Hour of Meeting of Class.
Practical Chemistry (twice weekly) (in sections).	
Anatomy . . . . .	11-12
Chemistry . . . . .	12-1
Zoology (Mondays and Fridays) . . . . .	2-3
Practical Zoology (twice weekly)	
Practical Anatomy . . . . .	Daily

### Winter (2nd Term)—

Practical Chemistry (twice weekly) (in sections).	
Anatomy . . . . .	11-12
Chemistry . . . . .	12-1
Zoology (Mondays and Fridays) . . . . .	2-3
Practical Zoology (once weekly)	
Practical Anatomy . . . . .	Daily

(*Examination in Chemistry and Zoology.*)

### Summer Term—

Histology (in sections).  
Practical Anatomy.

## Second Year.

### Winter (1st Term)—

Physiology . . . . .	10-11
Practical Physiology (twice weekly) . . . . .	11-1
Practical Anatomy and Demonstrations.	

### Winter (2nd Term)—

Physiology . . . . .	10-11
Practical Physiology (twice weekly) . . . . .	11-1
Practical Anatomy and Demonstrations.	

(*Examination in Anatomy and Physiology.*)

### Summer Term—

Pathology (Practical) (thrice weekly) . . . . .	8-10
Pathology (Morbid Anatomy) . . . . .	10-11
Surgical Out-patients . . . . .	11-12
Clinical Surgery . . . . .	12-2

## Third Year.

### Winter (1st Term)—

Medicine . . . . .	9-10
Materia Medica . . . . .	10-11
Clinical Medicine . . . . .	11-1.30
Pathology (including Elementary Bacteriology) . . . . .	2-3
Pathology (Morbid Anatomy) . . . . .	3-4
Practical Materia Medica . . . . .	3-4.30

### Winter (2nd Term)—

Medicine . . . . .	9-10
Materia Medica . . . . .	10-11
Clinical Medicine . . . . .	11-1.30
Pathology (including Elementary Bacteriology) . . . . .	2-3
Pathology (Morbid Anatomy) . . . . .	3-4
Practical Materia Medica . . . . .	3-4.30

(*Examination in Pathology and Materia Medica.*)

# Medical Education in Scotland

<i>Summer Term—</i>					Hour of Meeting of Class.
Out-patients (Medical)	.	.	.	.	11-1
Vaccination	.	.	.	.	3-4
Dispensary Practice	.	.	.	.	Afternoon

## Fourth Year.

### *Winter (1st Term)—*

Surgery	.	.	.	.	9-10
Midwifery (including Gynecology) (men only)	.	.	.	.	10-11
" " " " (women only)	.	.	.	.	10-11
* Sec. A. Diseases of Skin	} 11-12	Clinical Surgery			12-2
* " B. Diseases of Eye					
* " C. Diseases of Ear, etc.					
Dispensary Practice	}				Afternoon
Infectious Diseases (once weekly)					
Anæsthetics. <sup>1</sup>					
Optional Classes. <sup>2</sup>					

### *Winter (2nd Term)—*

Surgery	.	.	.	.	9-10
Midwifery (including Gynecology) (men only)	.	.	.	.	10-11
" " " " (women only)	.	.	.	.	10-11
Sec. " A. Diseases of Ear, etc.	} 11-12	Clinical Surgery			12-2
" B. Diseases of Skin					
" C. Diseases of Eye					
Mental Diseases (twice weekly)	.	.	.	.	3-4
Infectious Diseases (if not previously attended)	}				Afternoon
Dispensary Practice					
Practical Midwifery					

### *Summer Term—*

Operative Surgery	.	.	.	.	8-9.45
Public Health	.	.	.	.	10-11
Sec. A. Diseases of Children	.	.	.	.	11-1
" B. Diseases of Ear, etc.	} 11-12	Clinical Medicine			12-1.30
" C. Diseases of Skin					
Forensic Medicine	.	.	.	.	2-3
Infectious Diseases (if not previously attended)	.	.	.	.	Afternoon

(*Examination in Forensic Medicine and Public Health.*)

\* These classes are held thrice weekly, and on remaining days students must attend Clinical Surgery at 11 o'clock.

<sup>1</sup> Courses of instruction are given in the Autumn and Summer Terms.

<sup>2</sup> Optional courses are held in the subjects of *History of Medicine* (during the First Term of the Winter Session, twice weekly, 4 to 5 P.M., and may be attended by students who have passed the 1st Professional Examination); *Physical Methods in the Treatment of Disease* (during the First Term of the Winter Session, 4 to 5 P.M., twice weekly, and open to students who have passed the 3rd Professional Examination); *Neurology* (daily at 4 P.M. during the Second Term of the Winter Session, and open to students who have passed the 3rd Professional Examination); *Applied Anatomy* (thrice weekly, from 5 to 6 P.M. during First Term of Winter Session, and students are recommended to take the class in the Fifth Winter).



# Edinburgh

## Fifth Year.

### Winter (1st Term)—

	Hour of Meeting of Class.
Tuberculosis . . . . .	9-10
Clinical Gynecology . . . . .	10-11
Sec. B. Diseases of Children . . . . .	11-1
„ A. Diseases of Eye, 11-12 Clinical Medicine . . . . .	12-1.30
„ C. Clinical Medicine or Clinical Surgery.	
Dispensary Practice } . . . . .	Afternoon
Practical Midwifery }	
Optional Classes.	
Venereal Diseases.	

### Winter (2nd Term)—

Clinical Therapeutics . . . . .	9-10
Clinical Gynecology . . . . .	10-11
Sec. C. Diseases of Children . . . . .	11-1
Secs. A. and B. Clinical Medicine or Clinical Surgery . . . . .	12-1.30
Dispensary Practice } if not previously attended . . . . .	Afternoon
Practical Midwifery }	
Venereal Diseases.	

### Summer Term—

Tuberculosis . . . . .	9-10
Clinical Work in Hospital.	

*(Examination in Midwifery, including Gynecology, Surgery, and Medicine, and corresponding Clinical Examinations.)*

## FOR STUDENTS BEGINNING IN WINTER.

### First Year.

#### Winter (1st Term)—

Practical Chemistry (twice weekly) (in sections)	
Anatomy . . . . .	11-12
Chemistry . . . . .	12-1
Zoology (Mondays and Fridays) . . . . .	2-3
Practical Zoology (twice weekly)	
Practical Anatomy . . . . .	Daily

#### Winter (2nd Term)—

Practical Chemistry (twice weekly) (in sections)	
Anatomy . . . . .	11-12
Chemistry . . . . .	12-1
Zoology (Mondays and Fridays) . . . . .	2-3
Practical Zoology (once weekly)	
Practical Anatomy . . . . .	Daily

*(Examination in Chemistry and Zoology.)*

#### Summer Term—

Botany . . . . .	8-9
Practical Botany (on days to be arranged) . . . . .	9-11
Physics . . . . .	12-1
Practical Anatomy . . . . .	Afternoon

*(Examination in Botany and Physics.)*

# Medical Education in Scotland

## Second Year.

<i>Winter (1st Term)—</i>		Hour of Meeting of Class.
Physiology	.	10-11
Practical Physiology (twice weekly)	.	11-1
Practical Anatomy.		

### *Winter (2nd Term)—*

Physiology	.	10-11
Practical Physiology	.	11-1
Practical Anatomy and Demonstrations.		

### *Summer Term—*

Histology (in sections).		
Practical Anatomy and Demonstrations.		
<i>(Examination in Anatomy and Physiology.)</i>		

## Third Year.

### *Winter (1st Term)—*

Medicine	.	9-10
Materia Medica	.	10-11
Clinical Medicine	.	11-1.30
Pathology (including Elementary Bacteriology)	.	2-3
Pathology (Morbid Anatomy)	.	3-4
Practical Materia Medica	.	3-4.30

### *Winter (2nd Term)—*

Medicine	.	9-10
Materia Medica	.	10-11
Clinical Medicine	.	11-1.30
Pathology (including Elementary Bacteriology)	.	2-3
Pathology (Morbid Anatomy)	.	3-4
Practical Materia Medica	.	3-4.30

### *Summer Term—*

Pathology (Practical) (thrice weekly)	.	8-10
Pathology (Morbid Anatomy)	.	10-11
Clinical Surgery	.	12-2
Vaccination	.	3-4

*(Examination in Pathology and Materia Medica.)*

## Fourth Year.

### *Winter (1st Term)—*

Surgery	.	9-10
Midwifery (including Gynecology) (men only)	.	10-11
" (women only)	.	10-11
Sec. A. Diseases of Skin	} 11-12	Clinical Surgery. 12-2
" B. Diseases of Eye		
" C. Diseases of Ear, etc.		
Dispensary Practice	}	Afternoon
Infectious Diseases (once weekly)		
Anæsthetics. <sup>1</sup>		
Optional Classes. <sup>2</sup>		

<sup>1</sup> See Note on p. iv.

<sup>2</sup> See Note on p. iv.

## Edinburgh

*Winter (2nd Term)—*

Winter (2nd Term)—		Hour of Meeting of Class.
Surgery	.	9-10
Midwifery (including Gynecology) (men only)	.	10-11
	(women only)	10-11
Sec. A. Diseases of Ear, etc.	} 11-12 Clinical Surgery	12-2
„ B. Diseases of Skin		
„ C. Diseases of Eye		
Mental Diseases (twice weekly)	.	3-4
Infectious Diseases (if not previously attended)	}	Afternoon
Dispensary Practice		
Practical Midwifery		

*Summer Term—*

Operative Surgery	.	.	.	.	.	8-9.45
Public Health	.	.	.	.	.	10-11
Sec. A. Diseases of Children	.	.	.	.	.	11-1
„ B. Diseases of Ear, etc.	} 11-12	Clinical Medicine				12-1.30
„ C. Diseases of Skin						
Forensic Medicine	.	.	.	.	.	2-3
Infectious Diseases (if not previously attended)	.	.	.	.	.	Afternoon

*(Examination in Forensic Medicine and Public Health.)*

### Fifth Year.

*Winter (1st Term)—*

Tuberculosis	.	.	.	.	.	9-10
Clinical Gynecology	.	.	.	.	.	10-11
Sec. B. Diseases of Children	.	.	.	.	.	11-1
„ A. Diseases of Eye	11-12.				Clinical Medicine	12-1.30
„ C. Clinical Medicine or Clinical Surgery.						
Dispensary Practice	}	.	.	.	.	Afternoon
Practical Midwifery	}	.	.	.	.	
Optional Classes.						
Venereal Diseases.						

*Winter (2nd Term)—*

Clinical Therapeutics	.	.	.	.	.	9-10
Clinical Gynecology	.	.	.	.	.	10-11
Sec. C. Diseases of Children	.	.	.	.	.	11-1
Secs. A. and B. Clinical Medicine or Clinical Surgery	.	.	.	.	.	12
Dispensary Practice	} if not previously attended					Afternoon
Practical Midwifery						
Venereal Diseases.						

*Summer Term—*

Tuberculosis . . . . .	9-10
Clinical Work in Hospital.	

(Examination in Midwifery, including Gynecology, Surgery, and Medicine,  
and corresponding Clinical Examinations.)

The candidate must attend Hospital for not less than three years ; must attend both Clinical Medicine and Clinical Surgery for a period of at least nine months ; twenty cases of Midwifery, or twelve cases and three months' attendance at a Maternity Hospital ; and Post-Mortem Examinations for three months.

It is required that, before commencing the study of Practical Midwifery, every student shall have held the offices of Clinical Medical Clerk and



# Medical Education in Scotland

Surgical Dresser, and have attended a Course of Lectures on Surgery and Midwifery.

Two of the five years of study must be spent at the University, and not less than eight of the compulsory subjects of study must be taken in the University.

The minimum expense of M.B. and Ch.B., including fees for Classes, Hospital, Matriculation and Examination, amounts to about £175.

## DEGREE OF M.D.

Each candidate for this degree who began medical study after 1st October 1892 must be of the age of twenty-four years or upwards, and must have obtained the degrees of M.B. and Ch.B. of the University. He must either have been engaged for two years in general practice, or for one year in the naval or military medical services, or in the medical wards of a hospital, or in scientific research. He must present a thesis written by himself on a medical subject, and pass an examination in Clinical Medicine. In this examination the candidate has to write a report and commentary on at least three cases, and has to show a practical knowledge in the application of the ophthalmoscope, laryngoscope, electrical apparatus, and sphygmograph, in the examination of the blood, and in the chemical and microscopical examination of the excreta.

The candidate who has graduated M.B. and Ch.B. under the old regulations may either proceed to the degree of M.D. under the old regulations (under which he is not required to pass an examination in Clinical Medicine, but must have passed examinations in Greek and in Logic or Moral Philosophy), or he may proceed to the degree as if he had graduated M.B., Ch.B. under the New Regulations.

## DEGREE OF CH.M.

Each candidate must be not less than twenty-four years of age, must possess the degrees of M.B., Ch.B., must have attended the surgical wards of a hospital for one year, or have spent one year in scientific research or in the naval or military medical services, or two years in practice other than that restricted to medicine. He must submit a thesis on a surgical subject, and pass an examination on Clinical Surgery and its branches, Surgical Anatomy, and Operations on the Dead Body.

## FEES FOR M.D. AND CH.M.

The fee for the M.D. degree under the old regulations is five guineas; for the M.D. or Ch.M., under the New Regulations, fifteen guineas. The candidate must have paid the matriculation fee for the year in which he presents himself for examination or graduation. At each reappearance for examination, under the New Regulations, the fee is five guineas.

## DEGREES IN PUBLIC HEALTH.

Two degrees are granted by the University of Edinburgh in the department of Sanitary Science, viz. B.Sc. and D.Sc.

A Diploma in Public Health (D.P.H. Univ. Edin.) is also granted.

## BACHELOR OF SCIENCE.

Candidates must be graduates in Medicine of a University of the United Kingdom or of some other recognised University. In order to obtain the degree two examinations have to be passed.

*First Examination.*—Before entering for this examination the candidate must, after graduating in Medicine, have worked in a recognised Public

# Edinburgh

Health Laboratory for eight months, of which five consecutive months must be passed in the Public Health Laboratory of the University of Edinburgh.

He must also have attended in a Scottish University a course of lectures on Physics and a course of lectures on Geology, extending over three months, and approved of by the University Court.

The subjects of examination are as follows :—

- (1) *Laboratory work*—Practical, written and oral ; examination of water, air, foods, beverages, condiments ; sewage ; soils ; disinfectants ; building materials ; clothing ; bacteriology.
- (2) Physics. (3) Geology.

*Second Examination.*—This cannot be taken until eighteen months after graduating in medicine ; nor sooner than six months after passing the First B.Sc. Examination. The candidate must have attended two separate courses on Public Health, either in the University of Edinburgh or in some other recognised University or School.

Each course must consist of forty lectures, and include Medicine in its relation to Public Health and Sanitary Engineering.

The candidate must likewise produce evidence (1) that for six months he has studied sanitary work under a Medical Officer of Health for a county or burgh of not less than 25,000 inhabitants ; (2) that he has studied clinically for three months infectious diseases in a recognised institution ; (3) that for three months he has been instructed by a recognised teacher in mensuration and drawing.

The subjects of examination are :—

(1) Sanitation ; (2) Sanitary Law ; (3) Vital Statistics ; (4) Medicine in Relation to Public Health.

The candidate is examined orally, practically, and by a written paper. *Sanitation* includes making reports on dwellings, workshop, hospitals and sanitary schemes.

The University Court may modify the work and instruction prescribed from time to time.

## DOCTOR OF SCIENCE.

A graduate after having held the degree of B.Sc. for five years may present himself for the D.Sc. He must present a thesis or a published work or memoirs, the result of his own research, and must pass an examination in Public Health, and in such of its special subjects as the Senatus may determine. The candidate must submit the subject in which he proposes to be examined for approval not less than two months before the examination.

**FEES PAYABLE.**—First and second examinations, £3, 3s. each ; for D.Sc., £10, 10s.

## INSTITUTIONS FOR CLINICAL INSTRUCTION IN EDINBURGH.

Royal Infirmary. 921 beds and 42 cots. Fees—perpetual ticket, £12 ; one year, £6, 6s. ; six months, £4, 4s. ; three months, £2, 2s. Clinical instruction is given daily in Medicine, Surgery, and all their special branches.

Royal Hospital for Sick Children. 120 beds. Hospital ticket, £1, 1s. Fee for Qualifying Course, £2, 2s.

City Hospital for Infectious Diseases. 600 beds. Fee, £1, 1s.

# Medical Education in Scotland

Royal Maternity and Simpson Memorial Hospitals. 40 beds. The Maternity Residency affords accommodation for twelve students.

Royal Asylum, Morningside. 500 beds.

The fee for a qualifying course at each of these last two institutions is £2, 2s.

Royal Victoria Hospital for Consumption and Diseases of the Chest. 50 beds. Out-patient Department at Spittal Street.

Eye, Ear and Throat Infirmary. 6 beds ; 2700 Out-patients yearly. Fee for three months, £1, 1s.

Royal, New Town, Medical Missionary (Cowgate), Western, Provident (Marshall Street), Eye, and Skin Dispensaries.

## PROFESSORS AND LECTURERS IN EDINBURGH.

The Courses given by the Extramural Lecturers are recognised by the University and other examining boards as qualifying for graduation.

### *Botany—*

Professor Sir Isaac Bayley Balfour, M.D., Royal Botanic Garden.

### *Zoology—*

Professor J. Cossar Ewart, M.D., University.

Professor J. H. Ashworth, University.

Malcolm Laurie, D.Sc., Surgeons' Hall.

Hugh Miller, F.Z.S., New School.

### *Biology—*

Malcolm Laurie, D.Sc., Surgeons' Hall.

### *Physics—*

Professor C. G. Barkla, D.Sc., University.

G. A. Carse, D.Sc., University.

Dawson Turner, M.D., Surgeons' Hall.

### *Chemistry—*

Professor Barger, University.

G. H. Gemmell, F.I.C., 4 Lindsay Place.

T. W. Drinkwater, Ph.D., Surgeons' Hall.

### *Anatomy—*

Professor A. Robinson, M.D., University.

J. Ryland Whitaker, M.B., Surgeons' Hall.

### *Applied Anatomy—*

F. E. Jardine, M.B., University.

J. Ryland Whitaker, M.B., Surgeons' Hall.

### *Physiology—*

Professor Sir E. Sharpey Schafer, LL.D., University.

Alexander Goodall, M.D., Surgeons' Hall.

### *Materia Medica and Therapeutics—*

Professor A. R. Cushny, F.R.S., University.

John Orr, M.D., New School.

### *Pathology—*

Professor Lorrain Smith, M.D., University.

James Miller, M.D., Surgeons' Hall.



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## *Surgery—*

Professor Alexis Thomson, University.  
A. A. Scot Skirving, F.R.C.S., 27 Nicolson Square.  
Henry Wade, F.R.C.S., Surgeons' Hall.  
J. W. Struthers, F.R.C.S., New School.  
W. J. Stuart, F.R.C.S., New School.

## *Clinical Surgery—*

The Surgeons of the Royal Infirmary.  
Professor Sir Harold J. Stiles.  
Professor Alexis Thomson.  
Sir James Hodsdon.  
Sir David Wallace.  
Alexander Miles.  
John W. Dowden.  
A. A. Scot Skirving.  
And Assistant Surgeons.

## *Practice of Medicine—*

Professor G. Lovell Gulland, M.D., University.  
Harry Rainy, M.D., 27 Nicolson Square.  
R. A. Fleming, M.D., Surgeons' Hall.  
A. Dingwall Fordyce, M.D., Dental Hospital.  
W. T. Ritchie, M.D., New School.

## *Clinical Medicine—*

The Physicians of the Royal Infirmary.  
Professor G. Lovell Gulland.  
Professor F. D. Boyd.  
Sir R. W. Philip.  
Dr R. A. Fleming.  
Dr Harry Rainy.  
Dr Chalmers Watson.  
Dr Edwin Bramwell.  
And Assistant Physicians.

## *Midwifery and Gynecology—*

Professor Sir J. Halliday Croom, M.D., University.  
J. W. Ballantyne, M.D., Surgeons' Hall.  
A. H. F. Barbour, M.D., University and Royal Infirmary.  
R. W. Johnstone, F.R.C.S., New School.  
N. T. Brewis, F.R.C.S., Royal Infirmary.  
G. F. B. Simpson, M.D., New School.  
John M'Gibbon, M.B., 59 Forrest Road.  
H. S. Davidson, F.R.C.S., Nicolson Square.

## *Insanity—*

Professor G. M. Robertson, M.D., University and Royal Asylum.  
John Keay, M.D., Surgeons' Hall and Bangour Village Asylum.

## *Diseases of the Eye—*

J. V. Paterson, M.B., Royal Infirmary.  
A. H. H. Sinclair, M.D., Royal Infirmary.

## *Vaccination—*

W. G. Aitchison Robertson, M.D., D.Sc., Royal Dispensary.  
W. D. D. Small, M.B., Provident Dispensary.

## *Diseases of Children—*

J. S. Fowler, M.D.  
J. W. Simpson, M.D.  
A. D. Fordyce, M.D.

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## *Diseases of the Skin—*

Norman Walker, M.D., Royal Infirmary.  
Frederick Gardiner, M.D., Surgeons' Hall.

## *Diseases of the Ear, Nose, and Throat—*

A. Logan Turner, M.D., Royal Infirmary.  
J. Malcolm Farquharson, M.B., Royal Infirmary.  
J. S. Fraser, M.B., Surgeons' Hall.

## *Forensic Medicine—*

Professor Harvey Littlejohn, F.R.C.S., University.  
W. G. Aitchison Robertson, M.D., D.Sc., Surgeons' Hall.

## *Public Health—*

Professor C. Hunter Stewart, M.B., University.  
W. G. Aitchison Robertson, M.D., D.Sc., Surgeons' Hall.  
Wm. Robertson, M.D., Surgeons' Hall.

## *Fevers—*

Alexander James, M.D., City Hospital.  
C. B. Ker, M.D., City Hospital.

## *Bacteriology—*

Professor James Ritchie, M.D., University.  
J. Taylor Grant, M.D., 4 Lindsay Place.  
James Miller, M.D., Surgeons' Hall.  
Mabel Purefoy Fitzgerald, New School.

## *Diseases of Tropical Climates—*

Lieut.-Colonel D. G. Marshall, I.M.S., University and Surgeons' Hall.

## *Practical Medicine and Physical Diagnosis—*

Alexander Goodall, M.D., Surgeons' Hall.  
R. A. Fleming, M.D., Nicolson Square.  
J. D. Comrie, M.D., 59 Forrest Road.

## *Neurology—*

J. J. Graham Brown, M.D., University.

## *Physical Methods in the Treatment of Disease—*

Harry Rainy, M.D., University.

## *Tuberculosis—*

Professor Sir R. W. Philip, M.D., University.

## *Therapeutics—*

Jonathan Meakins, M.D., University.

## *Medical Electricity and Röntgen Rays—*

Dawson Turner, M.D., Surgeons' Hall.

## *Practical Anæsthetics—*

J. Stuart Ross, M.B., University.

## *History of Medicine—*

J. D. Comrie, M.D., University.

## *Venereal Diseases—*

David Lees, Royal Infirmary.

# Glasgow

## EDINBURGH POST-GRADUATE COURSES IN MEDICINE.

IN CONNECTION WITH THE UNIVERSITY AND ROYAL COLLEGES.

Short Advanced Courses for Graduates will be held during the Summer and Autumn Terms and the Summer Vacation.

The individual Courses will be held only provided a certain minimum number of Graduates enter for them; and, in certain Courses, a maximum limit will also be imposed.

The Courses will be conducted by teams of Teachers and the following subjects will be included, viz.:—Clinical Therapeutics; Tuberculosis; Diseases of the Blood; Diseases of the Renal System; Diseases of the Alimentary System; Diseases of the Circulatory System; Diseases of the Ductless Glands; Abdominal Surgery; Genito-Urinary Surgery; Surgery of Children; Clinical Gynecology and Clinical Obstetrics; Child Welfare; Diseases of the Larynx, Ear, and Nose; Ophthalmoscopy and Errors of Refraction; Venereal Diseases; Advanced Bacteriology; Advanced Medical Anatomy; Advanced Surgical Anatomy.

Arrangements will also be made, if necessary, for special instruction in Antenatal Maternity work; Psychiatry; and Dermatology.

Particulars in regard to the Courses—dates of commencement, fees, etc.—may be had on application to the Hon. Secretary, Post-Graduate Courses in Medicine, University New Buildings, Edinburgh.

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## UNIVERSITY OF GLASGOW.

### DEGREE OF M.B. AND CH.B.

During the last decade there has been a continual expansion of the facilities provided for both scientific and practical training. In 1919 three new Chairs were provided in Organic Chemistry, in Physiological Chemistry, and in Bacteriology, and four new University Lectureships have been instituted—two in Tuberculosis, one in the Surgical Diseases of Children, and the fourth in the Medical Diseases of Children.

The special feature of the school upon the practical side is the classification of the staff of Professors and Lecturers in the subjects of the two final years of study. Systematic as well as clinical classes are conducted not only at the Western Infirmary and adjoining University Buildings, but also at the Royal Infirmary. Students accordingly have the option of taking these subjects either at the Western or the Royal Infirmary. In this way the advantage is afforded of a very wide clinical field along with systematic instruction under University Professors, and the great disadvantage of attending classes at Gilmorehill and going to the Royal Infirmary, at a considerable distance, for clinical work is thus done away with. The same arrangement has been made in the case of Pathology. There are large and fully equipped Pathological Institutes, with class-room accommodation, at both Infirmaries, each under a University Professor who is *ex officio* Pathologist to the Infirmary, and has control of all the pathological material for purposes of instruction and investigation.

There is a Laboratory for Clinical Pathology at the Western Infirmary, the Director of which is also a University Professor, and gives instruction to University students in the scientific methods of clinical diagnosis.

Under the New Ordinance of the University Court, which came into operation on 1st October 1911, the regulations for these Degrees have been considerably altered, the chief modifications being as follows:—1. A rearrangement of the subjects of the four Professional Examinations. 2. The



# Medical Education in Scotland

rendering compulsory of some courses which hitherto have been optional.  
3. The imposition of restrictions as to the period at which certain subjects of the curriculum can be taken.

The academical year is now divided into three terms of about ten teaching weeks each, and the following list gives the subjects of the several Professional Examinations, with the period of study required :—

## FIRST EXAMINATION.

Chemistry (including Organic Chemistry), 2 terms ; with Practical Chemistry 1 term.

Physics (with practical work), 1 term.

Botany (with practical work), 1 term.

Zoology (with practical work), 1 term.

## SECOND EXAMINATION.

Anatomy and Practical Anatomy, 5 terms.

Physiology and Practical Physiology, 3 terms.

## THIRD EXAMINATION.

Materia Medica and Therapeutics, 2 terms.

Pathology and Practical Pathology, 3 terms.

## FOURTH EXAMINATION.

Medical Jurisprudence and Public Health, 2 terms.

Surgery, 2 terms.

Practice of Medicine, 2 terms.

Midwifery and Diseases Peculiar to Women and Infants, 2 terms.

The candidate must have attended the Medical and Surgical practice of a general hospital for three years, and courses of Clinical Surgery and Clinical Medicine of nine months in each case. He must also have received instruction, under conditions laid down, in the following subjects :—

Mental Diseases.

Practical Pharmacy.

Out-Patient Practice.

Clinical Clerking in Medicine.

Clinical Clerking or Dressing in Surgery.

Post-Mortem Examinations.

Infectious Diseases.

Gynecology.

Diseases of Children.

Ophthalmology.

Diseases of the Ear and Throat.

Dermatology.

Practical Midwifery with the Conduct of Cases of Labour.

Vaccination.

Administration of Anæsthetics.

Operative Surgery.

The following courses cannot be taken till after the end of the terms of the curriculum indicated in each case :—

Physiology and Practical Physiology—third term, and not (except Practical Histology) till at least three of the subjects of the First Examination have been passed.

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Materia Medica and Therapeutics, and Pathology and Practical Pathology—sixth term.

Medical Jurisprudence and Public Health—after completion of classes for the Third Professional Examination.

Midwifery, etc., Surgery and Medicine—ninth term, with the exception that Surgery may be attended after the sixth term, provided that the candidate has passed the second Professional Examination.

Hospital Practice, Clinical Medicine, Clinical Surgery—sixth term.

The curriculum extends over five years, two of which must be spent in the University of Glasgow. The remaining three years may be spent elsewhere, as indicated in the Ordinance and under the conditions thereby imposed.

Except in the case of Medicine, Surgery, and Midwifery, the Senate may accept the Professional Examinations of other Scottish Universities.

There are a number of other administrative regulations which need not here be specified in detail.

The examination fees are £23, 2s. in all, with an additional fee of £1, 1s. for every re-entry. The cost of the curriculum amounts roughly to £145, spread over the five years of the course, and at present the class fees are charged at so much a class. There is, however, a movement on foot to introduce a "composition" or "inclusive" fee per session, but the total will work out at practically the above figure.

## CLINICAL FACILITIES.

The following general hospitals, all of which are equipped in a modern fashion, are available for instruction of University students, viz. the Western Infirmary close to the University, the Royal Infirmary, to which the new Medical Chairs are attached, each of these having at present about 600 beds, and the Victoria Infirmary, with 260 beds, on the south side of the city.

The Eye Infirmarys at 174 Berkeley Street and 80 Charlotte Street (between them 100 beds), and the Ophthalmic Institution at 126 West Regent Street (35 beds), furnish ample opportunities for instruction in the important branch with which they deal; Insanity is equally well provided for at Gartnavel (460 beds), at Hawkhead (700 beds), at Gartloch (806 beds), and at Woodilee (1160 beds), while the City Fever Hospitals at Ruchill (540 beds) and Belvidere (680 beds) are available for the study of Zymotic Diseases. The Ear, the Throat and Nose, and the Skin are dealt with in the Western and Royal Infirmarys.

The Maternity Hospital, with every modern convenience and equipment, is situated in Rottenrow, and has accommodation for 104 patients. A new hospital for Sick Children, of greatly increased dimensions, in freer air, has been erected at Yorkhill within a short distance of the University. The beds number 200.

The Ordinance is applicable alike to men and women students, and much of the instruction is given in "mixed" classes by the Professors. There are, however, exceptions to this, some classes for women alone being held in a separate building (Queen Margaret College), and some for both sexes (in the main buildings at Gilmorehill) at different hours. Women are now admitted both to the Western and Royal Infirmarys on the same terms as men.

## PROFESSORS.

### *Zoology—*

Professor Graham Kerr, M.A., F.R.S.

### *Chemistry—*

Professor G. G. Henderson, D.Sc., F.R.S.

# Medical Education in Scotland

## *Organic Chemistry—*

Professor T. S. Patterson, D.Sc., Ph.D.

## *Practical Physics—*

Professor Gray, M.A., LL.D., F.R.S.

## *Botany—*

Professor Bower, Sc.D., F.R.S.

## *Anatomy—*

Professor Bryce, M.A., M.D.

## *Physiology—*

Professor Noël Paton, B.Sc., M.D., F.R.S.

## *Physiological Chemistry—*

Professor E. P. Cathcart, M.D., D.Sc., F.R.S.

## *Materia Medica and Therapeutics—*

Professor Stockman, M.D.

## *Pathology—*

Professor Muir, M.A., M.D., F.R.S.

## *Medical Jurisprudence—*

Professor Glaister, M.D., D.P.H. (Camb.).

## *Surgery and Clinical Surgery—*

Professor Sir William Macewen, M.D., LL.D., D.Sc., F.R.S.

## *Midwifery—*

Professor Murdoch Cameron, M.D.

## *Practice of Medicine and Clinical Medicine—*

Professor T. Kirkpatrick Monro, M.A., M.D.

## *Public Health—*

Professor Glaister, M.D., D.P.H. (Camb.).

## *Pathology—*

Professor John H. Teacher, M.A., M.D.

## *Bacteriology—*

Professor Carl H. Browning, M.D.

## *Medicine and Clinical Medicine—*

Professor Walter K. Hunter, D.Sc., M.D.

## *Surgery and Clinical Surgery—*

Professor Robert Kennedy, M.A., D.Sc., M.D.

*Midwifery—*Professor John M. Munro Kerr, M.D.

## LECTURERS.

## *Psychological Physiology—*

Henry J. Watt, M.A., Ph.D., D.Phil.

## *Ear—*

A. A. Gray, M.D., and J. Adam, M.D.

## *Throat and Nose—*

W. S. Syme, M.D., and J. Harper, M.B.



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## *Skin—*

John Wyllie Nicol, M.B., and G. M'Intyre, M.B.

## *Clinical Pathology—*

Professor C. H. Browning.

## *Bacteriology—*

G. Haswell Wilson, M.B., Ch.B.

## *Physics—*

James G. Gray, D.Sc.

## *Insanity—*

Landel R. Oswald, M.B., and J. H. Macdonald, M.B.

## DEAN.

Professor E. P. Cathcart, M.D., D.Sc., F.R.S.

## DEGREE OF M.D.

This degree is open to holders of the M.B., Ch.B. diploma, after a period of one or two years, according to circumstances, has elapsed since the date of the latter. The requirements are (a) an Examination in Clinical Medicine, or in some approved department of Medical Science or Practice; (b) a Thesis on any branch of knowledge comprised in the examinations for M.B., Ch.B., excepting a subject which is exclusively surgical; and (c) a fee of £15, 15s. with an extra charge of £5, 5s. for each re-entry.

## DEGREE OF CH.M.

This may be obtained on practically the same terms as the M.D. degree, the only differences being (1) that the examination is on Surgical Anatomy, operations upon the dead body, on Clinical Surgery or an approved special department of Surgery, and (2) that the Thesis must not be on a subject which is exclusively medical.

## DEGREE OF B.SC. IN PUBLIC HEALTH.

Candidates must be graduates in Medicine of a University in the United Kingdom or of some other University recognised for the purpose by the Glasgow University Court, and they must thereafter have received practical instruction, including instruction in Chemistry, Bacteriology, and the Pathology of the Diseases of Animals transmissible to man, for at least twenty hours per week during a minimum period of eight months, five consecutive months of which must be in the Public Health Laboratory of the University of Glasgow. Either before or after graduation in Medicine they must also have attended, in the University of Glasgow or elsewhere, courses of Physics and Geology, and after graduation two separate courses in Public Health (Medicine and Engineering), as well as practically studying sanitary work for six months under a Medical Officer of Health in the United Kingdom, or a Sanitary Staff Officer of Health of the Royal Army Medical Corps, besides attending three months' practice of a Hospital for Infectious Diseases, where methods of administration can be studied, and three months in Mensuration and Drawing. The examinations are, *First*, Public Health, Laboratory Work, Physics, and Geology; *Second*, Sanitation, Sanitary Law, Vital Statistics, and Medicine in its bearings on Public Health. The examination fee is £6, 6s.

# Medical Education in Scotland

## DEGREE OF D.Sc. IN PUBLIC HEALTH.

Five years after obtaining the B.Sc. degree, graduates may proceed to the higher Degree of D.Sc., the requirements being (*a*) a Thesis or a published memoir or work to be approved by the Senate; and (*b*) an examination in Public Health and in such of its special departments as the Senate and University Court may determine. The fee for this degree is £10, 10s.

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## QUEEN MARGARET COLLEGE FOR WOMEN.

(WOMEN'S DEPARTMENT OF THE UNIVERSITY OF GLASGOW.)

This is an integral part of the University of Glasgow. The courses, regulations, and fees for the medical course are the same as for men. The instruction is given by University Professors and Lecturers appointed by the University Court, partly in mixed and partly in separate classes. The College provides a separate building, with class-rooms, laboratories, library, and other teaching appliances. The administrative offices of the Women's Department are at Queen Margaret College. The women have all the rights and privileges of University students. Clinical work is amply provided for in the Royal Infirmary and its Dispensaries, the Western Infirmary, the Royal Hospital for Sick Children, the Glasgow Maternity Hospital, the Royal Asylum of Gartnavel, Belvidere and Ruchill Fever Hospitals, etc.

There are one or two small halls of residence near the College, and a list of lodgings can be obtained from the College Office.

All necessary information can be had from the Secretary to the Mistress, Queen Margaret College, Glasgow.

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## ST MUNGO'S COLLEGE.

St Mungo's College is contiguous to the Royal Infirmary, which is the largest hospital in Glasgow, and is situated in Cathedral Square, Castle Street. The classes are open to women students. There is car communication with every part of the city.

The Infirmary has, including the Ophthalmic Department, over 835 beds. There are special beds and wards for Diseases of Women, of the Throat, Nose and Ear, Skin, Venereal Diseases, Burns, and Septic Cases.

In addition to the large Medical and Surgical Departments, there are Departments for Special Diseases—namely, Diseases of Women, of the Throat and Nose, of the Ear, of the Eye, of the Skin, and of the Teeth. A fully-equipped Electrical Pavilion was opened a few years ago, and year by year the latest and most approved apparatus for diagnosis and treatment has been added. Wards are set apart for the teaching of women students.

*Appointments.*—Five House Physicians and twelve House Surgeons, having a legal qualification in Medicine and Surgery, who board in the Hospital free of charge, are appointed every six months. Clerks and Dressers are appointed by the Physicians and Surgeons. As a large number of cases of acute diseases and accidents of a varied character are received, these appointments are very valuable and desirable.

*Fees.*—The fees for (*a*) hospital attendance, including attendance at the Outdoor Department, at the Pathological Department, Post-Mortem

# Glasgow

Examinations, and the use of the Museum, and (b) Clinical Lectures, are as follows :—

- (a) For Infirmary Attendance, Dispensary, etc.—  
*A.* For Perpetual Ticket. . . . . £7 0 0  
*B.* For Season Tickets—  
     Six months . . . . . 2 2 0  
     Three months . . . . . 1 1 0  
 Separate payments by a student for Season Tickets amounting in all to £7, 7s. shall, however, entitle a student to obtain from the superintendent a Perpetual Ticket in exchange therefor.
- (b) For Clinical Instruction—  
     Two terms or six months . . . . . £3 10 0  
     One term or three months . . . . . 1 15 0
- (c) Students who have paid to any other hospital in the United Kingdom or elsewhere the fees necessary to obtain a Perpetual Ticket for such hospital shall be admitted as students of the Royal Infirmary on payment of a hospital entrance fee of £1, 1s. for attendance for six months, and 10s. 6d. for attendance for three months; and where a class for clinical instruction is taken, he shall pay in addition the fees for such instruction as above stated.

## THE ANDERSON COLLEGE OF MEDICINE.

DUMBARTON ROAD, PARTICK, GLASGOW.

The old Institution known as “Anderson’s University” was founded by the will of John Anderson, M.A., F.R.S., in 1795, and the medical school connected therewith dates back to the year 1799.

In 1877 the name of the Institution was altered from “Anderson’s University” to “Anderson’s College.” In 1887 the medical school of Anderson’s College became a distinct Institution known as “Anderson’s College Medical School.”

The new buildings are situated in Dumbarton Road, adjoining the Western Infirmary and the University. They are constructed on the best modern principles, and are provided with all the appliances requisite for the conduct and management of a fully equipped medical school.

Classes are conducted in all the subjects of the five years’ curriculum:—

*Anatomy*—Professor John Graham, M.B., Ch.B., B.Sc.

*Physics*—Professor Peter Bennett.

*Chemistry*—Professor Geo. Cruikshanks, Ph.D.

*Botany*—Professor B. G. Cormack, M.A., B.Sc.

*Zoology*—Professor Peter Macnair, F.G.S.

*Physiology*—Professor Edward J. Primrose, M.A., M.B.

*Materia Medica*—Vacant.

*Medical Jurisprudence*—Professor Carstairs Douglas, D.Sc., M.D., F.R.S.E.

*Midwifery*—Professor W. D. Macfarlane, M.B., C.M.

*Surgery*—Professor Archibald Young, B.Sc., M.B.

*Practice of Medicine*—Professor John Cowan, B.A., D.Sc., M.D.

*Ophthalmic Medicine and Surgery*—Professor A. J. Ballantyne.

*Aural Surgery*—Professor James Galbraith Connal, M.D.

*Diseases of Throat and Nose*—Professor John Macintyre, M.B., F.R.S.E.

*Mental Diseases*—Ivy Mackenzie, M.A., B.Sc., M.D.

*Public Health Laboratory*—Professor Carstairs Douglas, D.Sc., M.D., F.R.S.E.

*Pathology*—At the Western or Royal Infirmary.

*Diseases of the Skin*—Professor J. Goodwin Tomkinson, M.D.

*Dental Metallurgy*—Chas. Read, L.D.S., L.R.C.P.



# Medical Education in Scotland

*Degrees and Diplomas.*—Certificates of attendance on the classes at The Anderson College of Medicine are received by the Universities of London and Durham, by the Royal University of Ireland, and by all the Royal Colleges and Licensing Boards in the United Kingdom. They are also recognised by the Universities of Glasgow and Edinburgh under certain conditions which are stated in the Calendar of this school. The Public Health Laboratory Course is recognised as qualifying for the Diploma granted by the Universities of Oxford, London, and Cambridge, the Scottish Conjoint Board, and the Royal Irish Colleges.

Malcolm Kerr Bursary in Anatomy. Value about £10. Open to students of the junior anatomy class.

The Carnegie Trust will pay the fees of students at Anderson's, on conditions regarding which particulars may be obtained from The Secretary, Carnegie Trust Offices, Edinburgh.

*Class Fees.*—For each course of lectures (anatomy, ophthalmic medicine and surgery, aural surgery, diseases of throat and nose, mental diseases, diseases of the skin, and dental classes excepted), £3, 3s. Lectures on ophthalmic medicine and surgery, aural surgery, and diseases of the throat and nose, £2, 2s.; mental diseases, £2, 2s.; diseases of the skin, £1, 11s. 6d. For practical classes (except anatomy), viz., chemistry, £4, 4s.; physics, £2, 2s.; botany, £2, 2s.; zoology, £2, 2s.; pharmacy, £2, 2s.; physiology, £3, 3s.; operative surgery, £3, 3s.

*Anatomy.*—Winter—first session, lectures and practical anatomy, £5, 5s. practical anatomy alone, £2, 2s.; second session, lectures and practical anatomy, £4, 4s.; practical anatomy, £2, 2s.; for summer fees, see Calendar.

*Dental Classes.*—£3, 3s. each.

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## UNIVERSITY OF ABERDEEN.

The course of study for the degree of M.B., Ch.B. extends over five years, of which two at least must be spent in the University of Aberdeen.

The curriculum is the same as in the other Scottish Universities as far as relates to attendance on University classes, to clinical study at a General Hospital, to attendance on courses of Clinical Surgery, Clinical Medicine, Mental Diseases, and Practical Pharmacy, Operative Surgery, Anæsthetics, to instruction in Vaccination, to attendance on Cases of Labour, and to the practice of a Dispensary.

The candidate must also, before admission to the final examination, produce the following certificates:—

1. That he has been present at not fewer than twenty-five post-mortem examinations, some of which he must have personally taken part in performing.

2. That he has attended a course of instruction in Infectious Diseases consisting of not fewer than ten meetings, in a Hospital for the treatment of such diseases containing at least a hundred beds.

3. That he has attended in a Hospital a course of instruction in Gynecology consisting of not fewer than twenty meetings.

4. That he has attended in a special hospital a course of instruction in the Diseases of Children, consisting of not fewer than twenty meetings.

5. That he has attended in the Ophthalmological Department of a Hospital or Dispensary a course of instruction in Ophthalmology, consisting of not fewer than thirty meetings extending over one term.

6. That he has attended in a Public Hospital or Dispensary a course of instruction in Diseases of the Ear, Nose, and Throat, consisting of not fewer than twenty meetings.

# Aberdeen

7. That he has attended in a Public Hospital or Dispensary a course of instruction in Dermatology, consisting of not fewer than twenty meetings.

8. That he has attended a course of instruction in Venereal Diseases, consisting of not fewer than twelve meetings, in a recognised Hospital or Clinic centre for the treatment of such diseases.

Certificates for these various classes and courses must attest not only regular attendance, but also due performance of the work.

The order of study is prescribed by the Senatus and a scheme, representing the minimum curriculum, has been drawn up for the guidance of students, and is printed in the Calendar.

## THE FOLLOWING ARE THE CLASSES IN THE MEDICAL FACULTY :—

### WINTER SESSION.

*Zoology*—Professor John Arthur Thomson, M.A., LL.D.

*Chemistry (Syst. and Pract.)*—Professor Alexander Findlay, M.A., D.Sc., Ph.D.

*Anatomy*—Professor Reid, M.D., F.R.C.S.

*Practical Anatomy*—Professor Reid.

*Physiology (Syst. and Pract.)*—Professor MacWilliam, M.D., F.R.S.

*Materia Medica*—Professor Charles R. Marshall, M.A., M.D.

*Pathology (Syst. and Pract.)*—Professor Theodore Shennan, M.D., F.R.C.S.E.

*Public Health*—Mr John Parlane Kinloch, M.D., *Lecturer*.

*Surgery*—Professor John Marnoch, C.V.O., M.A., M.B., C.M.

*Medicine*—Professor Mackintosh, M.A., M.D.

*Midwifery and Diseases of Women and Children*—Professor R. G. M'Kerron, M.A., M.D.

### SUMMER SESSION.

*Botany*—Professor William G. Craib, M.A.

*Practical Botany*—Professor William G. Craib.

*Zoology*—Professor Thomson.

*Practical Zoology*—Professor Thomson.

*Physics*—Professor Niven, M.A., D.Sc., F.R.S.

*Practical Anatomy*—Professor Reid.

*Practical Materia Medica and Pharmacy*—Professor Charles R. Marshall, M.A., M.D.

*Physiology (Syst. and Pract.)*—Professor MacWilliam.

*Forensic Medicine*—Professor Hay, M.D., LL.D.

*Practical Hygiene and Forensic Medicine*—Professor Hay.

*Pathology (Syst. and Pract.)*—Professor Shennan.

*Practical Midwifery and Gynecology and Clinical Diseases of Children*—Professor M'Kerron.

There are Assistants to all the Professors in the Medical Faculty, and also Lecturers in special departments—Chemistry (2), Embryology, Parasitology, Bio-Chemistry, Experimental Physiology, etc.

Clinical Medicine and Clinical Surgery are taught by the Physicians and Surgeons of the Royal Infirmary.

The following are recognised as Lecturers :—

Lecturer on Mental Diseases	.	R. Dods Brown, M.D., F.R.C.P.E., Dip. Psych.
„ Ophthalmology	.	{ C. H. Usher, M.B., B.S., F.R.C.S. A. Rudolph Galloway, M.A., M.B., C.M.
„ Vaccination	.	T. Fraser, M.A., M.B., Ch.B.
„ Skin Diseases	.	J. F. Christie, M.A., M.B., C.M.

# Medical Education in Scotland

Lecturer on Diseases of Ear, Throat,	{ H. Peterkin, M.B.
and Nose . . . . .	{ Raymond Verel, M.B., F.R.C.S.
„ Medical Electricity . . . . .	{ J. R. Levack, M.B., C.M.
„ Anæsthetics . . . . .	{ Alex. Ogston, M.B., C.M.
„ Dental Surgery . . . . .	{ D. W. Geddie, M.B., C.M.
	{ J. M. P. Crombie, M.B., C.M., L.D.S. (Eng.).

All the University Classes are held at Marischal College.

Tutorial Classes are held in connection with most of the Systematic Courses, and practical instruction is given in the fully equipped Laboratories connected with the several departments.

Graduates or others desirous of engaging in special study or research may be allowed by the Senatus to work in any of the Laboratories on payment of the usual matriculation fee.

General clinical instruction is obtained in the following Medical Institutions :—

## *The Royal Infirmary of Aberdeen.*

This General Hospital, situated about seven minutes' walk from Marischal College, is constructed on the most modern principles, and is fully equipped with all the requirements for medical work and teaching. It accommodates upwards of 270 patients : the number of patients admitted during the year 1919 was 3017, and the number of out-patients treated during the same period was 14,145.

Six resident medical officers are appointed annually, three in May and three in September to hold office for twelve months. Salary, £52, 10s. with board, rooms, laundry.

*Fees.*—Perpetual fee to hospital practice, £10, or first year, £5, 10s., second year, £5, afterwards free ; clerkship in medicine, £1, 1s. ; dresser-ship in surgery, £1, 1s. ; pathological demonstrations, £2, 2s. (Special courses of lectures are charged for.)

## *The Royal Hospital for Sick Children*

Is situated about five minutes' walk from Marischal College, and accommodates over 80 patients. The number of patients admitted in 1919 was 914, and the number of out-patients treated was 1518. Each student must act as clerk for six weeks in the medical and surgical wards respectively.

There are two resident medical officers, who hold office for six months. Salary at the rate of £50 per annum.

Fee for hospital practice, £2, 2s. first year.

## *The Royal Asylum*

Is about fifteen minutes' walk from Marischal College. It accommodates over 950 patients, and is fitted up with a fully equipped hospital and a laboratory.

The senior physician is recognised by the University as lecturer on mental diseases, and delivers a qualifying course of lectures.

## *The City (Fever) Hospital*

Is about ten minutes' walk from Marischal College, and accommodates 250 patients.

Senior students are admitted for instruction in fevers under the visiting physician (who is the Medical Officer of Health for the City) and his assistant. Fee, £2, 2s.



# Aberdeen

## *General Dispensary and Vaccine Institution.*

This is about five minutes' walk from Marischal College.

The total number of cases treated during 1919 was 3212, and the number of patients treated at their own homes 2693.

*Fees.*—General practice, £3, 3s. ; vaccination certificate and instruction £1, 1s.

## *Aberdeen Maternity Hospital.*

This Institution is situated at the top of Castle Terrace, less than ten minutes' walk from Marischal College. Contains 18 beds. The number of patients treated in the hospital during 1919 was 420 and at their own homes 95—in all, 515. Fee, £3, 3s.

## *Ophthalmic Institution.*

This Institution is situated about three minutes' walk from Marischal College. The surgeon in charge is recognised by the University as a lecturer on ophthalmology.

During 1919, 2960 out-patients were treated.

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## PROFESSIONAL EXAMINATIONS.

There are four examinations ; the subjects and regulations of these are common to the Universities of Aberdeen and Glasgow.

### DEGREE OF M.D.

The regulations with regard to the age and other qualifications of the candidate are similar to those in the other Scottish Universities. He must submit a thesis written by himself upon any medical subject, and pass an examination in Clinical Medicine or in some Special Department of Medical Science or Practice.

### DEGREE OF CH.M.

Each candidate must be not less than twenty-four years of age, and must hold the degree of M.B., Ch.B. of the University. He must produce a certificate of having been engaged for at least one year in attendance in the surgical wards of a hospital, or in scientific research, or in the naval and military services, or for two years in practice other than practice restricted to medicine. He must present a thesis on a surgical subject and pass an examination on Clinical Surgery, Surgical Anatomy, and Operations on the Dead Body.

### DIPLOMA IN PUBLIC HEALTH (D.P.H.).

*Regulations Approved by the University Court, 11th May 1920.*

I.—Every candidate for the Diploma must be a graduate in Medicine of the University of Aberdeen, or of any other University whose medical degrees are recognised as qualifying for registration by the General Medical Council of the United Kingdom.

II.—No candidate will be admitted to examination until after the lapse of not less than twelve months from the date of his graduation in Medicine.

III.—The whole of the prescribed curriculum of study must be undertaken after the candidate has obtained a registrable qualification in medicine, and shall extend over not less than nine months, of which at least three months, or one academic term, must be spent in attendance at the University of Aberdeen.

IV.—Every candidate shall produce evidence of having complied with the following requirements in respect of study and training :—

# Medical Education in Scotland

(1) A course or courses of instruction consisting of not fewer than fifty meetings dealing with public health in relation to the administrative and other duties of a medical officer of health, including health and medical services and their organisation; education and propagandism; personal and environmental conditions; etiology, prevalence and control of disease; sanitary law and vital statistics—such course or courses to be given by a teacher or teachers in the department of public health of a recognised medical school.

(2) Practical instruction within a laboratory or laboratories approved by the University, in the following subjects as applicable to public health:—

(a) Bacteriology (including immunology) not less than 150 hours;

(b) Physics and chemistry—not less than 100 hours;

(c) Parasitology (including pathology of parasitic diseases) and entomology—not less than 50 hours;

such instruction to extend over not less than six months or two academic terms.<sup>1</sup>

(3) Practical instruction, clinical and administrative, within—

(a) a hospital for general infectious diseases—not less than thrice weekly;<sup>2</sup>

(b) a hospital or sanatorium or treatment centre for tuberculosis—not less than once weekly;

(c) a hospital or treatment centre for venereal diseases—not less than once weekly;

such instruction in each group to extend over three months.

(4) Practical instruction and experience during not less than three months (including attendance on at least thirty working days), in the duties, routine and special, of public health administration, under the personal supervision of a medical officer of health or other medical officer, as defined in the Rules of the General Medical Council;<sup>3</sup> or, alternatively that the

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<sup>1</sup> Rule 2 of General Medical Council, Note 2.

Alternative arrangements for British Armies in the Field. The Laboratory experience at a Base Hygiene Laboratory, when and so far as approved by the General Medical Council shall count towards the four months' Laboratory course prescribed by the Council; and Laboratory experience acquired by medical officers on the staff of hospitals for infectious diseases shall count for such part of the Laboratory course for the Diploma in Public Health as the Assistant Director for Medical Services (Sanitation) may recommend, and the General Medical Council on consideration may approve.

<sup>2</sup> Rule 4 of General Medical Council, Notes 1 and 2.

Note 1.—Methods of administration shall include the methods of dealing with patients at their admission and discharge, as well as in the wards, and the Medical Superintendence of the Hospital generally.

Note 2.—In the case of a Medical Officer of the Royal Army Medical Corps, a certificate from a Principal Medical Officer under whom he has served, stating that he has during a period of at least three months been diligently engaged in acquiring a practical knowledge of Hospital Administration in relation to Infectious Diseases may be accepted as evidence under Rule 4.

<sup>3</sup> The Medical Officers recognised for this purpose by the General Medical Council are:—

(a) In England and Wales, the Medical Officer of Health of a County or of a single or combined Sanitary District having a population of not less than 50,000, or a Medical Officer of Health devoting his whole time to Public Health work; or—

(b) In Scotland, a Medical Officer of Health of a County or Counties, or of one or more districts having a population of not less than 30,000; or—

(c) In Ireland, a Medical Superintendent Officer of Health of a District or Districts having a population of not less than 30,000; or—

(d) In the British Dominions outside the United Kingdom a Medical Officer of Health of a Sanitary District having a registrable Diploma in Public Health; or—

# Aberdeen

candidate has held, within the British Dominions, for a period of not less than three years an appointment as medical officer of health of a sanitary district with a population of not less than 15,000.

(5) Practical instruction in :—

- (a) Mother and Child Welfare (including ante-natal examinations) at a Centre or Centres in a Welfare Scheme conducted or approved by a Local or Sanitary Authority—not fewer than ten meetings ;
- (b) School hygiene and medical inspection of school children—not fewer than six meetings ;
- (c) Drawing and interpretation of plans—not fewer than six meetings.

V. The examination for the Diploma, which will extend over not less than six days, is divided into two parts, viz. :—

*Part I.*—Physics, chemistry, bacteriology (including immunology), parasitology and entomology, as applicable to public health.

- (a) Laboratory—two days,
- (b) Written and oral.

*Part II.*—(1) Infectious diseases (including tuberculosis and venereal diseases), etiology, epidemiology, diagnosis, specific treatment, prophylaxis, disinfection, and administrative control.

- (a) Clinical,
- (b) Written and oral.

(2) General hygiene.

Written and oral.

(3) Sanitary law and vital statistics.

Written and oral.

(4) Public health administration and health services.

Practical (including reports).

VI.—A candidate may enter for the examination in Parts I. and II. singly or together, subject to the condition that no candidate shall be allowed to pass in Part II. unless he has at the same or a previous examination passed in Part I. Candidates are, in general, recommended to undertake the examination in Part I. three months before presenting themselves for examination in Part II.

VII.—The fee for the examination is four guineas for each part, or eight guineas for the whole examination. In the event of a candidate failing to pass the whole or any part of the examination, a fee of one guinea is payable for each subsequent examination for which he may present himself.

VIII.—The examination shall be conducted by such Professors and Lecturers in the University and by such other persons as may be appointed for the purpose by the University Court.

IX.—The foregoing Regulations are subject to the requirements contained in the Resolutions and Rules of the General Medical Council in force at the time in regard to Diplomas in Public Health.

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(e) A Medical Officer of Health who is also a teacher in the Department of Public Health of a recognised Medical School ; or—

(f) A Sanitary Staff Officer, of the Royal Army Medical Corps having charge of an Army Corps, District, Command, or Division, recognised for this purpose by the General Medical Council, or in charge of a Base District on Lines of Communication of a British Expeditionary Force, and holding a Diploma in Public Health or other Public Health Qualifications ; or—

(g) An Assistant Medical Officer of Health of a County or of a single Sanitary District having a population of not less than 50,000 provided the Medical Officer of Health of the County or District in question permits the Assistant Officer to give the necessary instructions and issue certificates.



# Medical Education in Scotland

## FEES.

Arrangements have been made, in conjunction with the other Scottish Universities, for the institution of an inclusive fee for the courses of instruction leading to the M.B. and Ch.B. degrees. The inclusive fee for instruction within the walls of the University is ninety guineas, payable in five annual instalments.

The cost of matriculation, class and hospital fees for the whole curriculum including the fees for the degrees, is usually about £160.

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## UNIVERSITY OF ST ANDREWS.

The degrees conferred are Bachelor of Medicine and Bachelor of Surgery (M.B., Ch.B.), Doctor of Medicine (M.D.), and Master of Surgery (Ch.M.). The inclusive fee for the University instruction for M.B., Ch.B. is ninety guineas; and the inclusive fee for the clinical courses is forty guineas. These fees may be paid by annual instalments. For M.D. or Ch.M. the fee payable is fifteen guineas.

Two constituent colleges of the University provide medical teaching—the United College at St Andrews and University College in Dundee. At St Andrews classes for two years may be taken, and the student may pass the first and second professional examinations at St Andrews. There are excellent opportunities for combining degrees in Arts and Science with those of Medicine. Inclusive fees have been arranged for students who wish to take advantage of these opportunities. There are many bursaries offered to students who desire to graduate in Medicine, and it should be added that the cost of rooms and of living in St Andrews is considerably less than in the larger University cities. For women, both at St Andrews and in Dundee, there are excellent residential halls provided, which are governed by the University authorities. The medical school is now carried on in buildings specially built for the purpose.

The Conjoint School of Medicine, Dundee, supplies a complete course of medical study, and the student from the United College, St Andrews, completes his curriculum there. Large new buildings with well-equipped laboratories have been provided. Both in the Medical School and the wards of the Dundee Royal Infirmary the students have unrivalled opportunities for gaining a practical knowledge of medical science and of medical work, for they have individual attention and supervision which the larger schools cannot give.

The Dundee Royal Infirmary contains 400 beds, and includes special wards for obstetrics, gynecology, children's diseases, ophthalmology, dermatology, otology, and electrical therapeutics. New out-patient departments are now in use. There is a large out-door maternity department. Hospital Fees—Surgical and Medical, £3, 3s. yearly; Perpetual Ticket, £10, or in instalments, £10, 10s.; Obstetric Cases, £2, 2s.; Obstetric Clinic, £1, 1s.

Westgreen Asylum at Liff provides abundant material for instruction in mental diseases, and the City Fever Hospital in fevers. The Dundee Eye Institution furnishes cases for instruction in ophthalmology.

The Diploma of Public Health (D.P.H.) may be taken at the Conjoint School of Medicine, Dundee.

A Diploma in Dental Surgery (L.D.S.) is also granted by the University. Instruction in the University, Royal Infirmary, and Dundee Dental Hospital.

All classes in the University are open to men and women alike.

# St Andrews

## UNITED COLLEGE, ST ANDREWS.

### PROFESSORS AND LECTURERS.

- Physics*—Professor Butler, M.A.  
*Chemistry*—Professor Irvine, Ph.D., D.Sc.  
*Zoology*—Professor Thomson, M.A., D.Litt., F.R.S., C.B.  
*Botany*—R. A. Robertson, M.A., B.Sc.  
*Physiology*—Professor Herring, M.D.  
*Anatomy*—Professor D. Waterston, M.D., F.R.C.S.
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## UNIVERSITY COLLEGE, DUNDEE.

### PROFESSORS AND LECTURERS.

- Physics*—  
Professor Peddie, D.Sc.  
*Chemistry*—  
Professor Mackenzie, D.Sc., F.R.S.  
*Botany*—  
Professor Geddes, F.R.S.E.  
*Physiology*—  
Professor Waymouth Reid, M.B., Sc.D., F.R.S.  
*Anatomy*—  
Principal Mackay, M.D., LL.D.  
Lieut.-Col. Lamont, M.B., I.M.S. (retired).  
*Surgery*—  
Professor L. Turton Price, Ch.B., F.R.C.S.  
*Surgery, Clinical*—  
D. M. Greig, C.M., F.R.C.S.  
*Medicine*—  
Professor Stalker, M.D.  
*Medicine, Clinical*—  
Professor Stalker, M.D. ; J. Mackie Whyte, M.D.  
*Materia Medica*—  
Professor F. Charteris, M.D.  
*Pathology*—  
Professor Sutherland, M.B.  
*Midwifery and Gynecology*—  
Professor Kynoch, M.B., F.R.C.P., F.R.C.S.  
*Midwifery and Gynecology, Clinical*—  
Professor Kynoch, M.B., F.R.C.S., F.R.C.P.  
R. C. Buist, M.D.  
*Forensic Medicine and Public Health*—  
W. L. Buyers, M.D., D.P.H.  
*Ophthalmology*—  
Angus MacGillivray, M.D., D.Sc.  
*Diseases of Ear, Nose, and Throat*—  
R. P. Mathers, M.D.  
*Diseases of Children*—  
D. M. Greig, C.M., F.R.C.S.  
J. S. Y. Rogers, M.B.

# Medical Education in Scotland

## *Diseases of Skin—*

W. E. Foggie, M.D.

## *Mental Diseases—*

W. Tuach Mackenzie, M.D.

## *Vaccination—*

R. C. Buist, M.D.

## *Fevers—*

W. L. Burgess, M.D., D.P.H.

## *Clinical Pathology—*

F. M. Milne, M.B., D.P.H.

## *Clinical Medical Tutor—*

Charles Kerr, M.B.

## *Clinical Surgical Tutor—*

W. L. Robertson, Ch.B., F.R.C.S.

## *Anæsthetics—*

A. Mills, M.D.

## *Bacteriology—*

W. J. Tulloch, M.D.

## *Dean of the Faculty of Medicine—*

Professor Kynoch.

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## QUALIFICATIONS GIVEN BY THE SCOTTISH COLLEGES.

The Royal College of Physicians of Edinburgh, the Royal College of Surgeons of Edinburgh, and the Royal Faculty of Physicians and Surgeons of Glasgow, conjointly confer the Triple Qualification (L.R.C.P.E., L.R.C.S.E., L.R.F.P.S.G.). Female candidates are admitted to the examinations for this qualification.

**PRELIMINARY EXAMINATION.**—This examination must be passed before the student commences professional study. It may be passed before any of the Boards recognised by the General Medical Council, and enumerated in the Regulations of the Colleges. The Educational Institute of Scotland conducts a qualifying Preliminary examination for medical students, in Edinburgh and Glasgow, on behalf of the Colleges. This examination embraces English, Latin, Mathematics, and either Greek, French, German, Italian, or other modern language. All the subjects may be passed at one or not more than two times. Calendar, containing examination papers, can be had from Mr Hugh Cameron, M.A., 34 North Bridge Street, Edinburgh. Price 1s.

**PROFESSIONAL EDUCATION.**—The curriculum must extend over five years. Graduates in Arts or Science of any recognised University who have spent a year in the study of Physics, Chemistry, and Biology, and have passed an examination in these subjects for the degrees in question, are exempted from the first year of study. The fifth year of study should be devoted to clinical work in one or more recognised Hospitals or Dispensaries, and to the study of special diseases. For information regarding the payment of class fees by the Carnegie Trust, *vide* p. i.

## ORDER OF STUDY WHICH IS RECOMMENDED.

### *First Summer—*

Physics and Elementary Biology.

### *First Winter—*

Five months' course in Chemistry and Anatomy; three months' course in Practical Chemistry; Practical Anatomy.



# Qualifications given by the Scottish Colleges

## *Second Summer—*

Practical Anatomy and Lectures ; Practical Physiology.

## *Second Winter—*

Practical Anatomy ; Physiology—Five months' course.

## *Third Summer—*

Three months' course in Practical Pathology, Materia Medica, and Practical Materia Medica ; Surgical Hospital Practice.

## *Third Winter—*

Six months' course in Surgery and Clinical Surgery ; Attendance at Surgical Wards ; Anæsthetics ; Pathology.

## *Fourth Summer—*

Three months' course in Midwifery, in Gynecology, in Medical Jurisprudence and Public Health, and in Clinical Surgery ; Hospital Practice.

## *Fourth Winter—*

Six months' course in Medicine and Clinical Medicine ; Hospital Practice.

## *Fifth Summer—*

Three months at Clinical Medicine ; Hospital ; Insanity ; Diseases of Children ; Diseases of Eye.

Practical Midwifery—Three months' attendance at a Lying-in Hospital, and conduction of Twelve Cases of Labour under official supervision.

## *Fifth Winter—*

Hospital Practice ; Fevers ; Dispensary ; Vaccination ; Skin Diseases ; Ear and Throat Diseases ; Eye Diseases ; Venereal Diseases ; Operative Surgery.

PROFESSIONAL EXAMINATIONS.—Four of these are held during the curriculum. Each is held quarterly ; for the ensuing period three times in Edinburgh and once in Glasgow. Candidates may enter for all or any of the subjects at the First, Second, and Third Examinations. In the Final Examination the subjects of Medicine, Surgery and Midwifery shall be taken together at the conclusion of five Winters and five Summers of Medical Study, provided that a period of twenty-four months has elapsed since passing the Second Professional Examination ; and the subject of Medical Jurisprudence and Public Health may be taken at any time after passing the Third Examination. Candidates are advised to enter for the entire examinations.

## *First Examination—*

Physics, Chemistry, and Elementary Biology. This should be passed before the beginning of the second winter session.

## *Second Examination—*

Anatomy, Physiology, and Practical Physiology. This should be passed at the end of the second year of study.

## *Third Examination—*

Pathology, Materia Medica, and Pharmacy. This should be taken at the end of the third year.

## *Final Examination—*

Can only be taken at the end of the fifth year. The candidate must have attained the age of twenty-one. It includes—

1. Medicine, Therapeutics, Medical Anatomy, Clinical Medicine.
2. Surgery, Surgical Anatomy, Clinical Surgery, Diseases and Injuries of the Eye.

# Medical Education in Scotland

3. Midwifery and Diseases of Women.
4. Medical Jurisprudence and Public Health. This can be taken any time after the Third Examination.

## FEES FOR PROFESSIONAL EXAMINATIONS.

For each of the first three, £5 ; for the final, £15. The minimum total expense, inclusive of fees for classes and examinations, amounts to £115.

Fees for examinations in *Edinburgh* should be lodged with Mr D. L. Eadie, 49 Lauriston Place, and in *Glasgow* with Mr Walter Hurst, 242 St Vincent Street.

## DIPLOMA IN PUBLIC HEALTH OF THE ROYAL COLLEGES.

The Diploma is granted by the Triple Qualification Board.

1. Every candidate for examination must hold a registrable medical qualification, which has been registered under the Medical Acts.

2. After obtaining such qualification he must have attended a recognised Laboratory in which Chemistry, Bacteriology, and the Pathology of the Diseases of Animals Transmissible to Man are taught ; and the certificate must show that the candidate has conducted Chemical and Bacteriological analyses of air, water, sewage and foods, and certify that the candidate has attended not less than four calendar months, and that he has worked in the Laboratory for at least 240 hours, of which not more than one-half shall be devoted to Practical Chemistry. The following are alternative arrangements for British Armies in the field :—

The Laboratory experience at a Base Hygiene Laboratory, when and so far as approved by the General Medical Council, shall count towards the four months' Laboratory course prescribed by the Council ; and Laboratory experience acquired by medical officers on the staff of hospitals for infectious diseases shall count for such part of the Laboratory course for the Diploma in Public Health as the Assistant Director for Medical Services (Sanitation) may recommend, and the General Medical Council on consideration may approve.

3. After obtaining a registrable qualification he must during six months (of which at least three months shall be distinct and separate from period of Laboratory instruction required) have been engaged in acquiring a practical knowledge of the duties of Public Health Administration for not less than sixty working days under the personal supervision of—

- (a) In England or Wales, the Medical Officer of Health of a County or single sanitary District having a population of not less than 50,000, or a Medical Officer of Health devoting his whole time to Public Health work ; or
- (b) In Scotland or Ireland, the Medical Officer of Health of a County or District or Districts with a population of not less than 30,000 ; or
- (c) In Ireland, a Medical Superintendent Officer of Health of a District or Districts having a population of not less than 30,000 ; or
- (d) In the British Dominions outside the United Kingdom, a Medical Officer of Health of a Sanitary District having a population of not less than 30,000, who himself holds a Registrable Diploma in Public Health ; or
- (e) A Medical Officer of Health who is also a Teacher in the Department of Public Health in a recognised Medical School.

# Qualifications given by the Scottish Colleges

(f) A Sanitary Staff Officer of the Royal Army Medical Corps having charge of an Army Corps, District, Command, or Division recognised for the purpose by the General Medical Council. During the continuance of the war, Base Districts on Lines of Communication of a British Expeditionary Force will be recognised.

4. After obtaining a medical qualification he must have attended for three months at least twice weekly the practice of a Hospital for Infectious Diseases, at which he has received instruction in the methods of administration.

The examination consists of two parts. The first part includes—(a) Laboratory work, with Chemistry and Bacteriology; (b) Physics and Meteorology.

The Second Examination Embraces—(a) Report on premises visited; (b) Examination at Fever Hospital; (c) Examination at Public Abattoir; (d) Epidemiology and Endemiology; (e) Vital Statistics and Sanitary Law; (f) Practical Sanitation.

Each examination is held bi-annually, in October and May. The fee for each is £6, 6s.; for re-examination, £3, 3s. Fees and applications to be lodged with Mr D. L. Eadie, 49 Lauriston Place, Edinburgh; or with Mr Walter Hurst, 242 St Vincent Street, Glasgow.

## MEMBERSHIP AND FELLOWSHIP OF THE ROYAL COLLEGE OF PHYSICIANS, EDINBURGH.

Every applicant for the *Membership* must possess a recognised qualification, and be not less than twenty-four years of age. He must pass an examination on Medicine and Therapeutics, on Clinical Medicine, and on some Special Department of Medicine, such as Psychological Medicine, General Pathology and Morbid Anatomy, Medical Jurisprudence, Public Health, Midwifery, Diseases of Women, Diseases of Children, Tropical Medicine, etc. The Membership is conferred by election.

The fee for the Membership is thirty-five guineas, except the applicant be a Licentiate of the College, when it is twenty guineas.

Members of not less than three years' standing may be raised by election to the *Fellowship*, the fee being thirty-eight guineas, exclusive of Stamp Duty of £25.

The Membership and Fellowship Diplomas are now open to Women.

## FELLOWSHIP OF THE ROYAL COLLEGE OF SURGEONS, EDINBURGH.

Every candidate must be twenty-five years of age, and must have been engaged for two years in the practice of his profession, after having obtained a recognised qualification in Surgery. The petition for examination must be signed by two Fellows—a proposer and seconder.

The candidate must pass an examination on Principles and Practice of Surgery, including Surgical Anatomy, Clinical Surgery, and any one of the optional subjects; Surgical Pathology and Operative Surgery, Ophthalmology, Laryngology, Otology and Rhinology, Gynecology, Obstetric Surgery, Anatomy, and Dental Surgery and Pathology. The Fellowship is conferred by election.

The fee is £45, except the candidate be a Licentiate of the College, when the fee is £35. Further particulars may be obtained from the Clerk to the College, 49 Lauriston Place, Edinburgh.

The Fellowship Diploma is now open to Women.



# Medical Education in Scotland

## FELLOWSHIP OF THE ROYAL FACULTY OF PHYSICIANS AND SURGEONS OF GLASGOW.

Every candidate must have been qualified for two years, and be aged twenty-four. Admission to the Fellowship is by examination and subsequent election. The candidate is examined on either (a) Medicine (including Clinical Medicine, Medical Pathology, and Therapeutics), or (b) Surgery (including Clinical Surgery, Operative Surgery, Surgical Anatomy, and Surgical Pathology); and on one optional subject—Anatomy, Physiology, Pathology, Midwifery, Diseases of Women, Medical Jurisprudence, Ophthalmic Surgery, Aural, Laryngeal and Nasal Surgery, Dental Surgery, State Medicine, Psychological Medicine or Dermatology.

The fee is £30, except the candidate be a Licentiate of the Faculty, when it is £15.

The Fellowship Diploma is now open to Women.

# Edinburgh Medical Journal

Founded 1805

EDITED BY  
ALEXANDER MILES AND J. S. FOWLER

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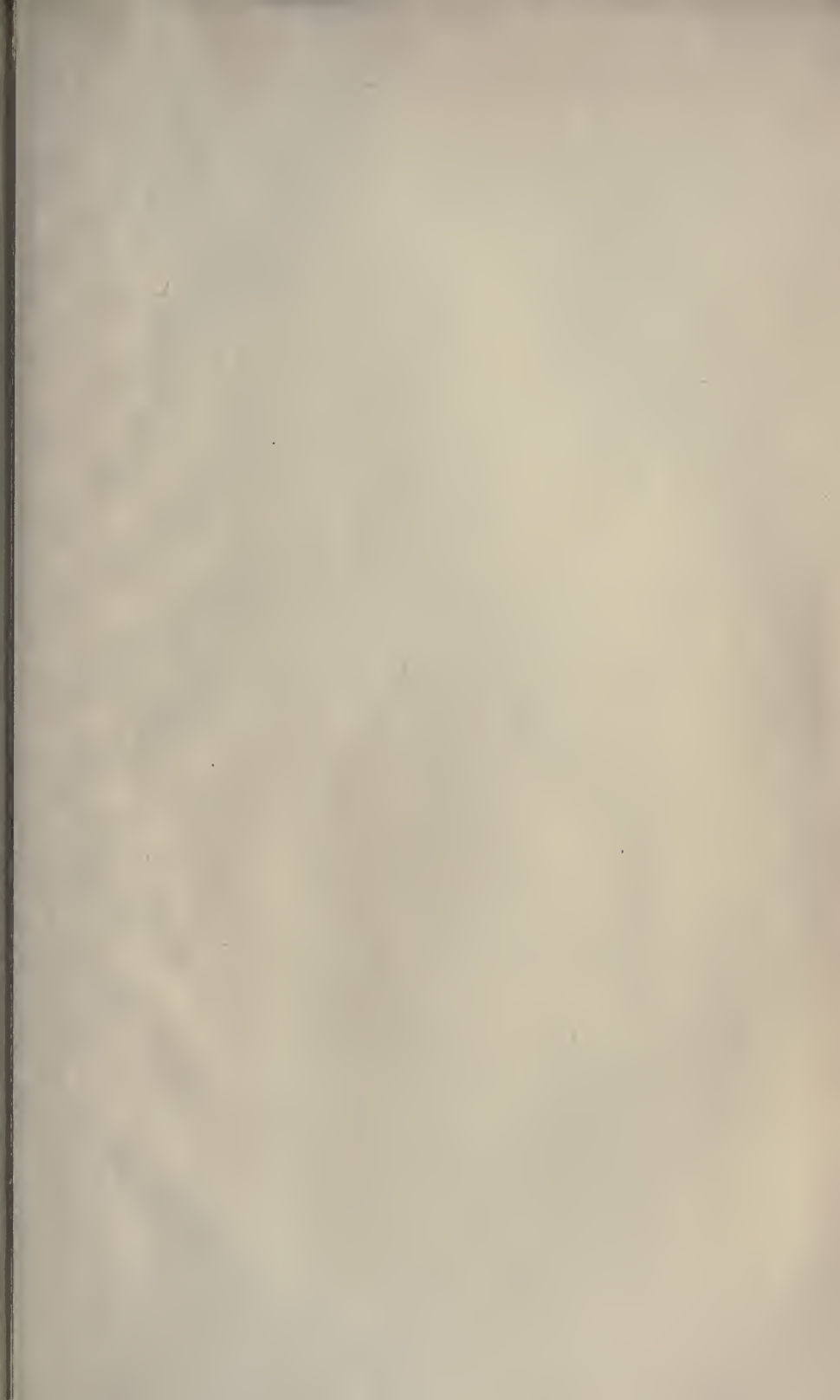


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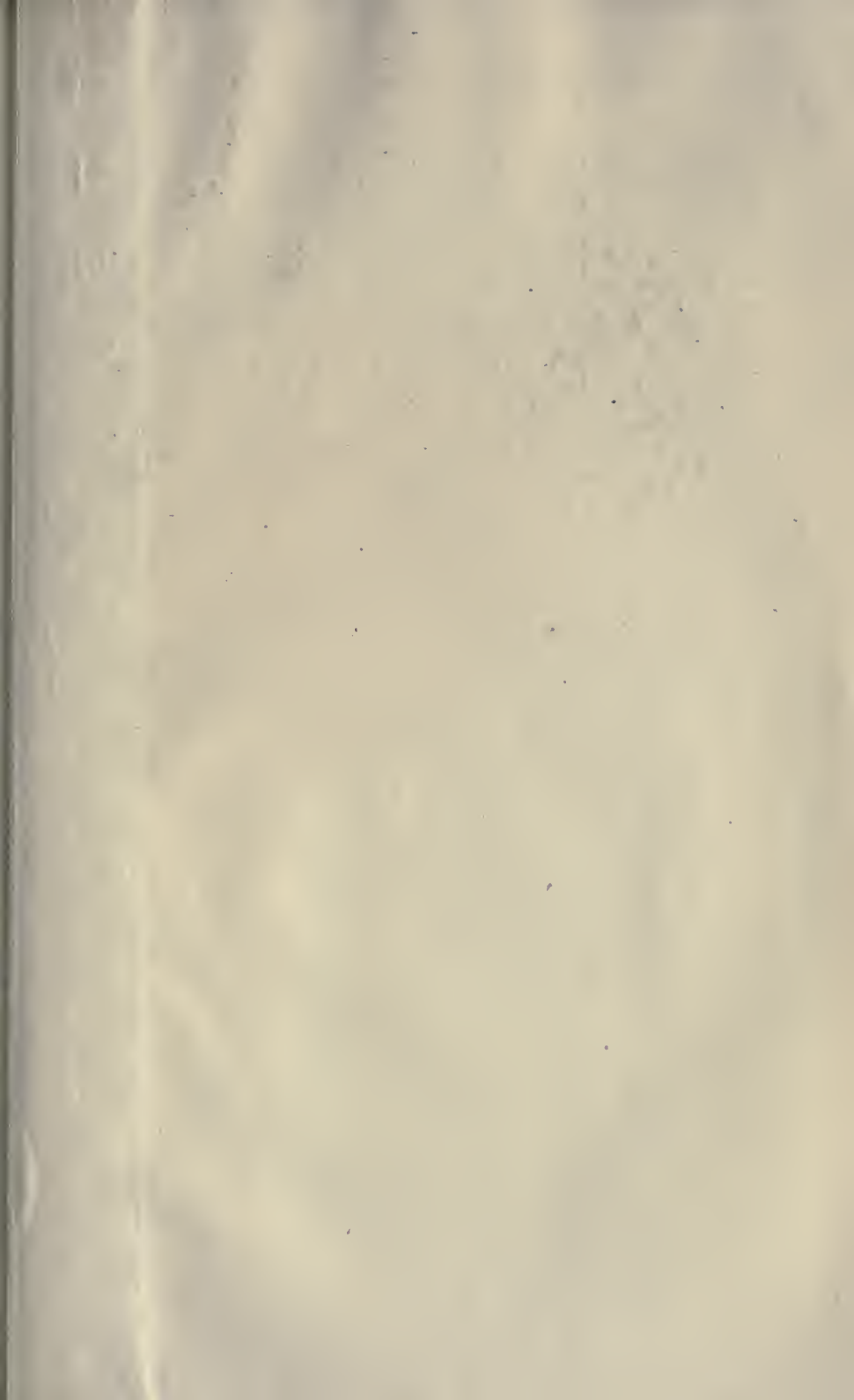
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